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Sea water as a fuel

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ABSTRACT

Now a day's fuel demand and cost are in peak so, to overcome this problem hydrogen may be an alternative fuel. But the Storage and production cost is high, hence planned to generate hydrogen by using sea water. This process is precisely reasonable and is a good procedure for an environmentally-clean, commercial making associated product.

The plan of this effort is to examine the variation of the tension and energy consumption at electrolysis of natural seawater comparative with electrolysis of a solution of NaOH, in the same conditions. During the electrolysis process chlorine and sodium hydroxide are the additional by- products, combination of hydrogen applications like automobiles, power plants, and domestic applications.

KEY WORDS: Hydrogen, Electrolysis.

1. INTRODUCTION

Day by day the growing costs of fuels and increasing environmental pollution, the hydrogen production are seen as a practical solution to the above problems. Particularly strategic role is played by water electrolysis process. It is promising to spawn hydrogen by conventional DC water electrolysis, but this is undesirable for an environmental reason.

The hydrogen is separated from the sea water by electrolysis process. It is the precisely practicable and is an outlook procedure for an environmentally-clean, commercial production of hydrogen associated products. The second route of the seawater electrolysis gives the impression to be the most real one.

The process can be conducted with reasonable rates giving a lot amount of target products. However, the chlorine shall be derivative, which may be arrival into the environment only in a safe form. This can be done, for an occasion, by translating the chlorine containing in anodic gasses into hypochlorite. The hypochlorite is an antibacterial product broadly used for drinking or waste waters.

Hydrogen energy: Hydrogen is the largest part of copious constituent in the universe. Yet, there is effectively no natural hydrogen gas resource on Earth.

When released, it quickly rises to the superior atmosphere and dissipates, leaving in effect no hydrogen gas in the earth surface, because hydrogen gas must pretend from feedstock's that contain hydrogen Compounds. Some of the resources used for hydrogen production like fossil fuels, coal, natural gas, nuclear, biomass and other renewable energy technologies. The storage of hydrogen is a portable and stored in a reservoir, after the fuel is used for applications. In the middle of all options hydrogen best fulfills these requirements lightness, highest energy density, adaptability, clean and inexhaustible.

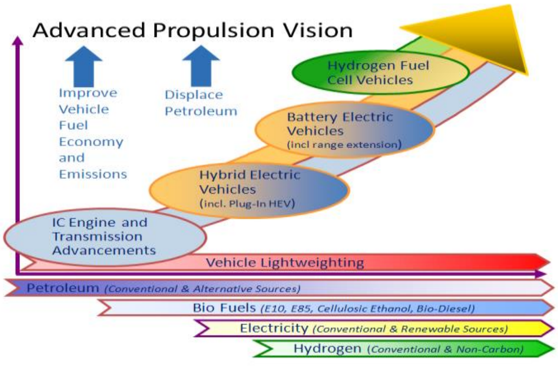

Figure.1. Adnavced Propulsion Vision

Significance of hydrogen energy: Hydrogen has considerably potential and clean power source for a global range of applications, including power generation and transportation areas in the country.

Production of hydrogen:

Nuclear High-Temperature Electrolysis: The water electrolysis is improved by a nuclear reactor. It would be used to produce hydrogen. By increasing the temperature of the water, less electricity is required to split it into hydrogen and oxygen, which reduces the total energy required

High-Temperature Thermo Chemical Water-Splitting: Another water electrolysis process-splitting method, in this reaction the high temperature generated by nuclear reactor. During this chemical reactions that divide water into hydrogen and oxygen.

Photo Biological and Photo Electrochemical: Certain microbes, cyanobacteria, produce hydrogen by splitting water in the presence of sunlight as a by-product of their usual metabolic processes. Other microbes can extract hydrogen directly from biomass.

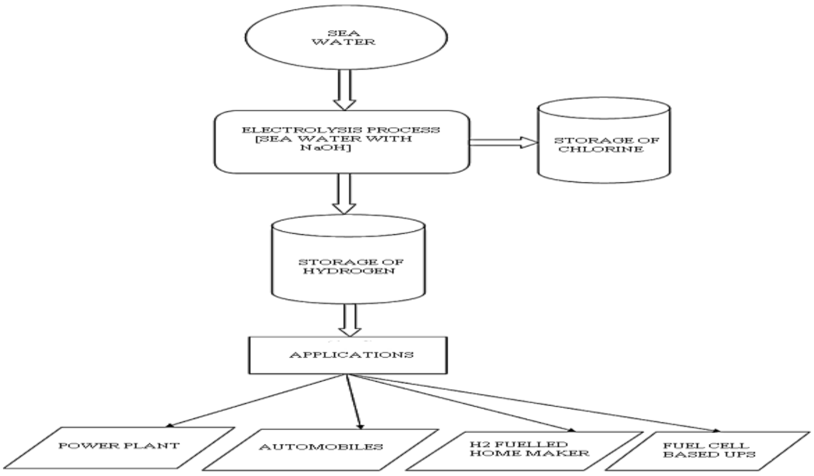

Figure.2. Hydrogen production flow chart

Electrolysis of Sodium Chloride: Electrolysis is the direct electric current through an ionic substance is dissolved in a suitable solvent.

This results in chemical reactions at the electrodes and the separation of materials. The commonly used methods of electrolysis involved in aqueous sodium chloride. The electrolysis cell is divided into two "rooms" by a block. Saturated sodium chloride solution is passed through the anode compartment; leaving at a lower concentration. Sodium hydroxide solution is circulated through cathode compartment, exiting at a higher concentration.

A portion of the concentrated sodium hydroxide solution leaving the cell is diverted as product, while the remainder is diluted with deionised water and passed through the electrolysis apparatus again. The techniques which used are Castner-Kellner cell and the Gibbs Diaphragm cell. In the left-hand anode compartment of the cell chloride ions are oxidized to chlorine gas. Sodium ions then pass across the solution to the cathode compartment.

There, the water molecules are reduced into hydrogen gas, leaving hydroxide ions. Some of this solution is taken for concentration and sale, and some is watered down with water to 30% concentration and return to the bottom of the anode compartment.

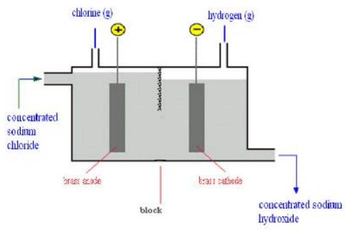

Figure.3. Electrolysis process

$$2Cl^- \longrightarrow Cl_2 + 2e^- \text{ or } Cl^- \longrightarrow \tfrac{1}{2} Cl_2 + e^-$$

$$2H_2O + 2e^- \longrightarrow H_2 + 2\,OH^-, \text{ or } 2H^+ + 2e^- \longrightarrow H_2$$

Figure.4. Electrolysis process

Working of Electrolysis Process: Sodium chloride solution contains; Sodium ions, Chloride ions, Hydrogen ions (from the water), Hydroxide ions (from the water).

Chemical reaction at the Cathode: Sodium ions and hydrogen ions (from the water) are attracted to the negative cathode. It is much easier for a hydrogen ion to pick up an electron than for a sodium ion. So this reaction happens: As the hydrogen ions are converted into hydrogen gas, the water equilibrium tips to the right to replace them.

Separation of gases: If chlorine comes into contact with hydrogen; it produces a mixture which will explode violently on exposure to sunlight or heat. Chlorine also reacts with sodium hydroxide solution to produce a mixture of sodium chloride and sodium chlorate also known as sodium hypochlorite. This mixture is commonly sold as bleach. The block is designed to separate the gases.

Production of the Chlorine: Chlorine, along with its important by-product, sodium hydroxide, is produced from the readily available starting material, rock salt (sodium chloride). It is well known for its use in sterilizing drinking water and in particular swimming pool water. However, most chlorine is used in the chemical industry in the manufacture of other products. Sometimes chlorine is in the product molecule but on other occasions it is used to produce intermediates in the manufacture of products that do not contain chlorine and the element is recycled.

Production of the Sodium Hydroxide: NaOH, is also known as lye or caustic soda. Electrolysis of concentrated sodium chloride solutions (brine) produces chlorine gas, hydrogen gas and aqueous sodium hydroxide. $Cl_2(g)$ is produced at the anode (positive electrode).

Hydrogen: Hydrogen is a gas discovered by boyle in 1671 French chemist Antoine Lavoisier named hydrogen from the Greek words for "water former." Hydrogen is found in the atmosphere at trace levels.

Chemical Properties: Hydrogen is more soluble in organic solvents in water. It does not react with other chemicals at room temperature. Two hydrogen molecules of (H_2) and one oxygen molecule of (O_2), combine to form two molecules of water, or H_2O. Chlorine, gas or liquid, is non-explosive and non-flammable.

Physical Properties: The following properties are for pure chlorine, “Standard conditions”. Where referenced are temperature at 32°F (O°C) , an absolute pressure of 14.696 psi (101.325 kPa) and boiling Point (Liquefying Point) = -29.15°F (-33.97°C).

Density: Saturated Gas = at 32°F (O°C), 0.7632 lb/ft3 (12.23 Kg/m3). Saturated Liquid = 91.56 lb/ft3 (1467 kg/m3) at 32°F (0°C). Latent Heat of Vaporization = 123.9 Btu/lb (288.1 kJ/kg). Melting Point - Freezing Point = -149.76°F (-100.98°C). Solubility in Water = 6.93 lbs/100 gals. (60°F and 14.696 psi). VISCOSITY Saturated Gas = 0.0125 centipoise (0.0125 mPa·s) at 32°F (0°C); 0.0132 centipoise (0.0132 mPa·s) at 60°F (15.6°C) Liquid = 0.3863 centipoise (0.3863 mPa·s) at 32°F (0°C); 0.3538 centipoise (0.3538 mPa·s) at 60°F (15.6°C). 4.9.

Hydrogen storage: In the development of attractive hydrogen storage options, fundamental materials properties and their impact on system design are critical, compact and light.

Computational representation of hydrogen reservoir materials and system routine can help to fully distinguish and be aware of the limitations of accessible storage technologies and identify novel concepts of hydrogen storage. Hydrogen is likely key to the success of hydrogen vehicles, provided the hydrogen reservoir method is Compact and light-weight.

Is consistent with low-cost, energy-efficient hydrogen production, allows easy refueling and safe operation. A vision of hydrogen as a vehicle energy carrier offers the outlook of an eventual transition to using an extensive range of renewable resources for vehicles. Better hydrogen storage could lead to cost-reduction of hydrogen fuel as it could allow the utilization of remote resources and long-distance transport.

Now the hydrogen storage has been more a barrier than an enable to all these technologies because of problems with Weight & volume of Energy use & cost Fueling infrastructure, improvement in storage of material performance and improving the storage capacity will required enable to a better system design. Better advanced storage materials are needed that will have Lower weight Smaller volume Lower cost Better stability Additional material requirements must be met to allow improvement in System-level characteristics: Low energy use for hydrogen liberation.

Easy and energy efficient "recharging" or recycling Low-temperature and pressure operation. Achieving the necessary improvements will require: A solid accepting of the essentials to the hydrogen reservoir Invention Solid experimentation both system-level and fundamental material improvements will be required to achieve superior performance of highly developed energy storage methods. System level issues can easily dominate characteristics and performance storage space materials. Materials improvements will be needed to allow mitigation of the system-level issues. Intermittent renewable such as solar and the wind, the output may be fed directly into an electricity grid.

2. CONCLUSION

Sea water (sodium chloride) is another important source of hydrogen production; the electric energy is enough and cheap to counter balance the high consumption. The hydrogen gas separated from the sea water.

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