Solar power to create hydrogen fuel from sea water.

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Abstract:- **Stanford scientist have devised generate hydrogen fuel from seawater using solar power.**
Researcher were able to conduct up to 15 times more electricity by their multi-layer device.Which help it produce hydrogen from sea water at a faster rate.In this technique splitting water into hydrogen and oxygen present an alternative to fossil fuels but purified water is a special resource.Often referred to as the "Holy grai" of energy storage,the economic and efficient conversion of water into hydrogen and oxygen with electricity (electrolysis) has been a goal of scientists for decades.The amount energy stored per kilogram of hydrogen is roughly two and a half times larger than natural gas and,most importanty,the only by product of burning hydrogen for energy is water.There is still quite a way to go with this technology which needs to be scaled up and commercialised if it is going to give us a hydrogen –fuelled future,but the early tests run by the researchers show promising results.

Keywords:-Electrolysis,Emissions,Energy,Fossil,Generate,Hydrogen,Oxygen,
Solar energy,Splitting,

Introduction:-

Splitting water into hydrogen and oxygen present an alternative to fossil fuels,but purified water is a precious resource.A Stanford-led team has now developed a way to harness seawater –Earth's most abundant source for chemical energy.A new way to generate hydrogen fuel using solar power,electrodes,and saltwater from San Francisco Bay.New way of separating hydrogen and oxygen gas from seawater via electricity.Existing water splitting methods rely on highly purified water,which is a precious resource and costly to produce.

Theoretically to power cities and cars, need so much hydrogen it is not conceivable to use purified water.The electrolysis process is completed by placing two electrodes in the water.When the power is turned on,hydrogen gas bubbles from the negative end (The cathode),and oxygen is produced at the positive end (The anode).But when electrolysis is done in sea water, the negatively charged chloride corrodes the anode.

A typical electrolyser consists of two metal electrodes-anode and cathode-that are immersed in an electrolyte solution and separated by a membrane.When electricity is passed through the solution ,oxygen bubbles of the anode and hydrogen bubbles of the cathode .To minimise the amount of energy required to liberate the hydrogen from water ,both electrodes are typically coated with a catalyst.

The device developed by the Stanford team has many similarities to commercial electrolysers-but with critical tweaks that allows it to use seawater instead of purified water.

As anyone who has been unfortunate enough to swallow a mouthful of seawater knows,it is salty.Salt or sodium chloride ,if you remember high school chemistry,is composed of negatively charged chloride atoms,and positively charged sodium atoms.The solar cell used in this work is known as a " Perovskite" and has been the topic of intense study over the last five years because it is potentially inexpensive and capable of achieving impressive energy conversion efficiencies.A previous study by a Swiss team utilized a "Perovskite" solar cell to efficiently drive the electrolysis of water and the Stanford group was able to achieve a similarly high efficiently with seawater.

Methods and materials:-

Researcher report a simple, economical new method to produce hydrogen: they use solar power and special Nickel –based electrodes to directly split seawater into hydrogen and oxygen.

Hydrogen is a clean burning fuel that would only produce water when it is burned.Right now,it is mostly produced by reforming natural gas using steam.An easy,ages-old way to produce hydrogen is to split water via electrolysis ,but the process requires purified water ,which is costly on top of competing with potable water resources,but electrolyzing it brings up problems,negatively-charged chloride ions in seawater corrode the catalyst and the positive electrode.

Researchers made an anode that repels chloride ions and resists corrosion.They start with a Nickel foam core that is conductive.They coat it with a layer of Nickel sulfide,and then a Nickel-based catalyst.

During electrolysis ,the Nickel sulfide undergoes chemical reactions and transforms into a negatively charged sulphate layer that repels chloride and keeps it from reaching and corroding the core.

Without the negatively charged coating,the anode only works for around 12 hours in seawater ,according to scientist the whole electrode falls apart into a crumble but with this layer it lasts more than a thousand hours.

In the future ,this new method could be used for tasks beyond generating energy.The process also creates breathable oxygen,so divers or submarine could take devices into the ocean the and generate without having to surface for air.There really is no " Chemical formula" for salt water. Salt Nacl or sodium chloride and water as a substance ,H_2O,is a homogenous mixture or a solution ...it contains a lot of H_2O,Nacl,and many other ions and compounds,including chemicals from human industry,agriculture and waste.H^+ ions are responsible for the conduction of electricity.To carry out electrolysis in water ,a few drop of H_2SO_4 is added to the water.It is because pure water is bad conductor of electricity.

Results and discussions:-

Electrolysis of water can be achieved in a simple hand-on project,where electricity from a battery is passed though a container of water.The electrolysis of brine is a large-scale process used to manufacture chloride from salt.Two other useful chemicals are obtained during the process one is sodium hydroxide (NaOH) and another is Hydrogen (H_2).In electrolysis process of seawater,platinum electrode is not used,because you get only hydrogen and oxygen.Graphite electrode is not used for electrolysis,because part of it reacts to make Carbon dioxide,and the rest disintegrate into fine powder that fine powder that turns the water black. This take some hours,so it will for a while,but the graphite anode is definitely a consumable item.At elevated temperature water molecules split into their atomic components-hydrogen and oxygen.For example at 2200^0C about three percent of all H_2O molecule are dissociated into various combination of hydrogen and oxygen atoms,mostly H,H_2,O,O_2,and OH,other reaction products like H_2O_2 or HO_2 remain minor.When done on an industrial scale,the electrolysis of elements like Al cause the carbon electrodes to deteriorate.This means that they have to be replaced justly regularly thus making the process more expensive.The most common side effects after an electrolysis session are tenderness,redness and some swelling .These side effects are all normal end temporary.If done improperly ,electrolysis can cause infection and permanent scarring.In order to get hydrogen gas we need to separate water molecule. Every water molecule include two atoms of hydrogen and one atom of oxygen.We use a process called electrolysis to break apart water molecule into hydrogen and oxygen and so more hydrogen produced in electrolysis of water.

The addition of salt and acid to act as an electrolyte catalyst as most salt and acids dissolve in water.If a water soluble electrolyte is added,the conductivity of the water rises considerably and speed up electrolysis of water.

Conclusion:-

Hydrogen is a cheaper fuel than gasoline on paper,the reality is,as of 2010,it is much more expensive.Researcher are still working the technology to produce and transport hydrogen fuel.Thus,fueling stations are limited,making the cost of hydrogen fuel vary widely.When liquid hydrogen is stored in tanks,it is relatively safe,but if is escape there are associated hazards.Topping the list of concerns is hydrogen burns,in the presence of an oxidizer-oxygen is a good one-hydrogen can catch fire,sometime explosively,and it burns more easily than gasoline does.In the future hydrogen will join electricity as an important energy carrier,since it can be made safely from renewable energy sources and non-polluting.It will also be used as a fuel for " zero-emissions"vehicles.

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