

Generation and utilization of electrical energy using sea water by electrolysis process

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Abstract: In this paper we explore some simple experiments involving homemade sea- water batteries that are not only instructive, but which can be used to drive low-power devices. The concept evolved for basic way of producing energy and converts that into electrical energy by burning metals and gets electricity (or electrical energy) by a condition for oxidation which by itself is the same as slow burning. This paper explores the electrochemistry behind an air battery using copper cathode, aluminum anode, and saltwater. If we have exact solution of saltwater and some metals we were able to generate small voltage. This on a higher generation of voltage will give another non-conventional source of energy for generation of power. This system proposes a new idea to generate hybrid power more effectively with sea water activated battery. The advantages, disadvantages, biological impacts and applications are also presented.

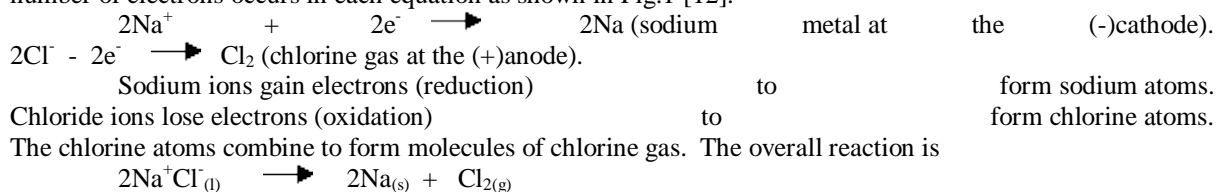
Keywords: Electrolysis, Distributed Generation, Non-conventional sources, Generation of Electricity.

I. Introduction

World energy consumption is continuously rising, especially in the developing countries. to meet their energy requirements we need to expand the use of renewable sources. Sea water is one of the most upcoming renewable energy sources used now a day's Sea water power generation is not affected by daylight, storms and earth quake, and can function 24 hours per day year round. Further, seawater power generation does not take up large piece of land, with no carbon dioxide production and can desalinate seawater. Seawater power generation is the best new energy solution for coastal regions and countries with oceanic climate, as it makes effective use of natural resources. By keeping this in mind in this paper we explore some simple experiments involving homemade sea- water power generation that are not only instructive, but which can be used to drive low-power devices. We are producing a condition for oxidation which by itself is the same as slow burning. If we have exact solution of saltwater and some metals we were able to generate small voltage. This on a higher generation of voltage will give another non-conventional source of energy for generation of power.[11]

II. Electrolysis In The System

The paper proposed uses the process of splitting up substances that conducts electricity when in the molten state or in solution. Pure water is very poor conductor of electricity because there are so few ions in it. To enable water to conduct electricity better, some dilute sodium chloride solution is added. When the power is turned on the electrical current flows through this solution, gases can be seen to be produced at the copper electrodes (cathode) and they are collected in the side arms of the apparatus which is aluminum (anode). The reactions at each electrode are called half equations. The half equations are written so that the same number of electrons occurs in each equation as shown in Fig.1 [12].



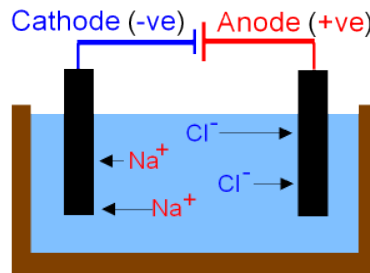


Fig. 1: The Electrolysis process

III. Generation of Electrical Energy from Ocean Water

The generation of power required only 3 major components and few connecting wires. These major components are Aluminum cans, Copper sheet, Ocean water (salt water). Aluminum cans are used to store salt water in it. It also acts as cathode (negative terminal). The copper sheets are made into strips. This copper strips is dipped inside the saltwater, which is placed inside the aluminum can. Now, the copper strips, once dipped, should have mechanical support such that there is direct contact between the copper strip and aluminum can. If the mechanical support is not properly adjusted and the copper strip is in direct contact with the aluminum can, then the electron from the reaction due to copper and saltwater will discharge through aluminum and there won't be any voltage appearing across the terminal.

A slight difference can be seen between natural ocean water and man-made ocean water, as the ocean water contains many minerals. Some of those minerals won't be present in the man-made saltwater. The ocean water salinity is 3.5% - 4.2% as shown in Table.1, keeping that in mind the salt is added to the water. For every 100ml of water, 4g of salt is added.[1]

Sea water composition (by mass) (Salinity=3.5%)			
Element	percent	Element	percent
oxygen	85.84	sulfur	0.091
hydrogen	10.82	calcium	0.04
chloride	1.94	Potassium	0.04
sodium	1.08	Bromine	0.0067
magnesium	0.1292	carbon	0.0028

Table.1: Sea water composition

IV. Effect of catalyst and Area of cross section

Voltage is improved using a catalyst, it has been experimentally observed that when few drops of vinegar is used as a catalyst voltage improves. If the saltwater is added with a heterogeneous catalyst, like bleaching powder, the conduction increases further. Fig.2 bar graph shown is between voltages and without catalyst and different catalyst.

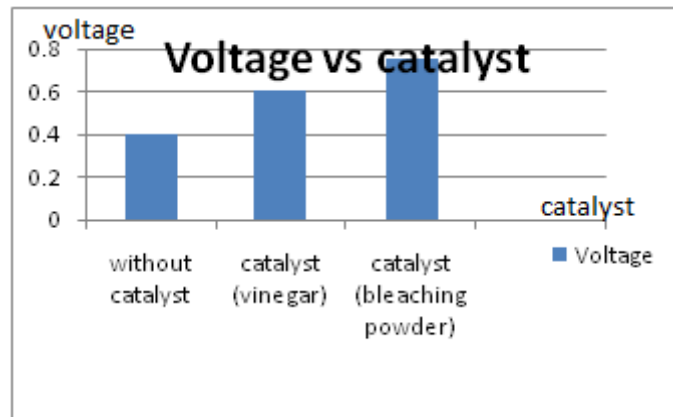


Fig. 2: graph of voltage verses catalyst

When a copper is place inside the saltwater, we get a potential difference. If we increase the area of cross-section dipped in the saltwater, the voltage does not change but the current value improves. By increasing the area of cross-section, the overall power generated is also improved. The below graph is between current and area of cross-section as shown in Table 2 and Fig 3.

Sno	Area Of Cross-Section (Cm ²)	Current (mA)
1	22.5	8
2	45	12
3	900	33

Table.2: Readings of current and area of cross-section

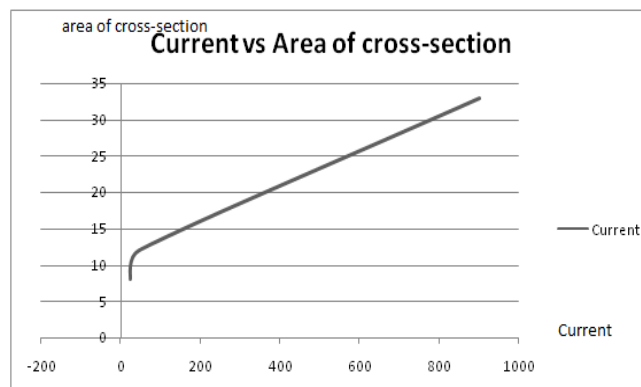


Fig. 3: graph between Current verses Area of cross-section

V. APPLICATIONS

If generation of power from ocean water becomes successful then following will be the possible applications

- If generated in kilowatts and above then it can be used a base load plant for the cities situated near by the ocean.
- Mostly the beaches are tourist places, by using these shops and decoration lights can be powered, as it will be easily available.
- Seashore have seaport and nearby seaport we will have light house. The light house will have a bulb. This bulb can be given supply from the generation from ocean water.
- Just like the above few application, we can have many application from this kind of power generation.

VI. MERITS AND DEMERITS

Merits:

- The availability of Ocean/Sea water is huge and generation from it makes it renewable energy resource.
- The percentage of renewable energy resource will increase with implementation of the power generation from ocean/sea water.
- It is low installation cost.
- One of the electrode i.e., aluminum, which helps us to recycle aluminum products.
- The value of voltage and current will be increased by adding small amount of catalyst to the ocean/sea water so that we can increase the plant capacity.
- It is clean energy, therefore Diesel can be avoided.
- It can also be used as back up energy source.

Demerits:

- The copper electrode which is of the electrode will get eroded due to the formation of copper chloride, so we should replace the copper electrode which increases the cost.
- Due to the erosion of copper electrode the value of current will get decreased which affects the plant capacity.
- This project only benefits for the places near to the oceans/seas.
- Bleaching powder when used as catalyst has little effect on the copper as time increases, as they for a coating of copper chloride on it which is blue in color.
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VII. FUTURE SCOPE

Once it starts generation in kilowatt, the usage of this will increase at greater rate. This can not only used near seashore but also to the boats or yachts that needs electrical to run the motor in ocean. India has a high scope to generate power from this source as most part of land is next to ocean. As it will be one time investment, it will be of great significant in the future for India.

VIII. CONCLUSION

The ocean water available in plenty can also be used for generation of power and utilizing them is great achievement. The ships on the ocean will be benefited most as diesel motor can be replaced by way of generating power. On seashore, we can give supply to the near hotels or shops. As we know the decoration is very much necessary nowadays to attract people this energy can be used in the lighting up the decoration lights. The generation of power from ocean gave us to look the ocean as a new source of power generation at the time where we see the fossil fuels are slowly depleting. As near future will be only depending on renewable energy, this will be one of them.

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