Using CO_2, Sodium, and water to Produce Electricity on Venus: Experimental Trial.

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Energy is one of the most essential things for exploring space. Therefore, we discussed how to store energy on a planet by exploiting some of the sources that were found on its surface.

Venus is this planet. It has been discovered that Venus has substances that can assist storing energy on its surface.

Further research shows that 96.5% of the atmosphere of Venus is composed of carbon dioxide and it is important as the increase in water acidity caused by carbon dioxide is a main stage in the experiment.

Additionally, because Venus is so close to the sun, its oceans have evaporated, so the water for the experiment will be brought from the earth.

Venus has been discovered to have sodium-containing rocks, which will support the experiment since sodium makes up the metal anode.

The main idea is a liquid battery. A sodium metal anode is placed in an organic electrolyte and a cathode is placed in an aqueous solution. The two liquids are separated by a sodium Super Ionic Conductor (NASICON) membrane. Then, injecting carbon dioxide into the aqueous solution reacts with the cathode, turning the solution more acidic. By increasing the acidity of the Solution, the number of protons increases, which in turn increases the power to attract electrons. Finally, an electrochemical reaction happens to produce electricity.

The challenge is to design an energy storage system that will power the surface of Venus for at least 60 days, so that there is viable energy storage capability for long-duration exploration missions, so it has been decided that this energy will be stored using two lithium sulfur dioxide batteries by specific characteristics by a specific way.

The entire reaction begins when **CO_2** is injected into the water; at that point, the conversion efficiency of **CO_2** is high at 50%, eliminating **CO_2** and producing electricity and **H_2**.

Materials and Methodology

A. Materials:

Materials were used to make the idea more applicable:

1. Organic electrolyte.
2. Aqueous solution (Sodium bicarbonate solution).
3. Sodium super ionic Conductor (NASICON) membrane.
4. Sodium metal.
5. Pure hard silicone bowl.

B. Methodology:

The NASICON membrane, organic electrolyte, and aqueous solution were first placed in the silicone bowl because its heat resistance is 500 Celsius. A sodium Super Ionic Conductor (NASICON) membrane separates the two liquids. The aqueous solution then contains a cathode.

The organic electrolyte was then filled with a sodium metal anode. The aqueous solution received an injection of this **CO_2**.

After that, it reacts with the cathode, making the solution more acidic. As a result, there are more protons in the solution, which improves its ability to attract electrons.

Finally, an amount of electricity and hydrogen was generated. This electricity will s by the two batteries by a series circuit.

Results and Discussion

A. Results:

- When carbon dioxide and ocean water interact, the acidity of the water increases.
- As ocean water's acidity increases, so does the number of protons.
- The prototype will produce 2.71 volts (theoretical) and practically 1.3 volts.
- The prototype produced 0.41 ampere.
- The prototype's power equals 1.11 watt
-the power provided by the battery equals 22.62 watts.
-the battery's voltage equals 2.9 volts.
- hydrogen gas was produced

B. Discussion:

The concentration of **CO_2**, the acidity of the water, and the number of protons all have a direct relation to one another.

When this **CO_2** combines with water, the solution turns to be more acidic. This acidity of water is the reason for the outcomes of the research.

The outcomes of the research are electricity and **H_2**. Electricity will be stored in batteries making Venus a place for energy storage. These batteries are called lithium sulfur dioxide with a limited voltage equal 2.9 volts, capacity equal 7800 mAh, and power equal 22.62 wh. This battery is already used in the Venus rover. The prototype produces 1,3 volts practically and the battery needs at least 2.9 volts at least so three prototypes are needed to

charge every single battery. The prototypes will be connected in a series to increase the voltage. The recharge time equals 2 to 3 hours. In this way, the required energy is produced.

Conclusion and Recommendation:

A. Conclusion:

Finally, after a lot of research and tests, it was found that the project is successful.

This liquid battery provided the needed energy by multiplying the number of prototypes by three prototypes for every single battery.

With the increase in the concentration of this **CO_2** in water, the acidity of the water increases in the liquid battery.

This acidity of water is the reason for the outcomes of the research. These outcomes are electricity and hydrogen gas.

The electricity will be stored in two lithium sulfur dioxide batteries. These batteries will be used to store energy in the rover for 60 days at least.

The idea was simple, but its effects are worthy.

B. Recommendation:

Two products are created after the chemical process in the battery is finished: electricity and hydrogen gas.

Because hydrogen fuel is less expensive than gasoline, it is recommended to store it in tanks and export it to Earth and use it as a vehicle fuel.

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