CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

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Project Number

J0616

Project Title

The Effect of Electrolysis on Solar Desalination

Abstract

Objectives/Goals

I investigated whether the electrolysis of water affects solar desalination. My hypothesis was that electrolysis of saline water will increase the solar desalination process because the electric current generated by a solar panel will break apart the hydrogen and oxygen atoms in the water molecule increasing the total quantity of desalinated water produced.

Methods/Materials

METHODS: Collected five gallons of saline water from a groundwater well. Placed one cup (236.5ml) of water in 40 clear glass bowls. Added 3 drops of red coloring dye to distinguish between the saline and distilled water. Connected wires to the positive and negative output on a solar panel. Attached a carbon electrode to each wire and placed one positive and one negative charged electrode in 20 bowls. Inside all 40 bowls I placed a smaller bowl to collect the water produced during the experiment. All bowls were covered with plastic wrap with a fishing weight in the middle so that the plastic wrap sloped down over the center of the small bowl. All bowls were placed on a door wrapped in black aluminum foil. The solar panel was turned on and all bowls were placed outdoors and exposed to the same environment for 2 days (7am to 7pm). Every two hours I observed and recorded the voltage generated by the solar panel and the environmental conditions. At the end of two days I made final measurements of the total quantity of water produced in all 40 bowls. Finally, I took water samples for the original and desalinated water to a commercial laboratory to determine the salinity.

MATERIALS: 5 gallons groundwater; solar panel; 40 large & small glass bowls, weights, rubber bands; 20 carbon electrodes & alligator clips; wiring; air/water thermometers; aluminum foil; dye; paint.

Results

Test results showed the total salinity of the groundwater reduced significantly from 3200uS/cm (Original) to 200-170uS/cm (Distilled). The electrolysis of the saline water increased the total water produced during solar desalination by 33.94%. The total production for the Base Condition was 272.5ml compared to 365ml for the Electrolysis bowls. The average production for the Base Condition bowls was 13.625ml compared to 18.25ml for the Electrolysis bowls.

Conclusions/Discussion

The electrolysis of the saline water had a significant effect on the amount of water produced by solar desalination.

Summary Statement

This project applies the process of solar desalination to highly saline groundwater to investigate whether electrolysis affects the quantity of desalinated water produced under set conditions.

Help Received

My father assisted by connecting the wires to the solar panel and electrodes, and working with me to record some of the measurements during the experiment. Semitropic WSD provided the groundwater sample, Power Systems, Inc. loaned the solar panel and Zalco Laboratories, Inc. donated the salinity