CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

S0906

Project Title

The Microbial Fuel Cell: Is Warmer Better?

Abstract

Objectives/Goals

A microbial fuel cell is a bio-electrochemical system that creates electrical power by copying bacterial interactions found in the natural world. The bacteria within the fuel cell break down the waste that is put in, and in the process, generate electrons which are then used to create an electrical current. The objective of the experiment was to determine if a microbial fuel cell will produce more electricity if it is kept at a higher temperature.

Methods/Materials

To conduct the experiment, two identical fuel cells were constructed using a single mud sample from a local reservoir. Plastic containers were used for the anodes and cathodes, PVC pipe and agar were used to make the salt bridges, an air pump was used to supply oxygen, and copper wire and carbon cloth were used to make the electrodes. After being built, both fuel cells were tested using a multimeter and produced the same voltage. One fuel cell was then placed in a room temperature environment (approximately 20 degrees Celsius) and another was placed in a heated incubator (approximately 30 degrees Celsius). Using the multimeter, the voltages generated by both fuel cells were recorded on a regular basis for 6 weeks.

Results

The result was a significantly higher voltage of 0.30 mV coming from the heated fuel cell as opposed to a voltage of 0.13 mV coming from the room temperature fuel cell. This is an increase of about 131.00%. Also, the temperature of the fuel cell kept in the room temperature environment fluctuated more due to the fact that it was kept in an air conditioned room as opposed to an incubator. The electrical output also fluctuated more for the fuel cell that was kept in the air conditioned room, showing that there is indeed a correlation between the temperature of the fuel cell and the amount of electricity that it generates.

Conclusions/Discussion

The results of the experiment support our hypothesis that at a higher temperature, a microbial fuel cell will produce more voltage. This information is extremely significant as if fuel cells are created on a larger scale (such as wastewater treatment plants), stationing them in a naturally warm environment (a desert, for example) will allow them to produce much more green energy.

Summary Statement

The objective of our experiment was to determine if higher temperatures would yield higher voltages in the fuel cells.

Help Received

Ms. Claire Fasching answered some questions pertaining to what research hasn't been done yet; Mr. Dirk Sikkema let us use his incubator