CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34782

Project Title

Soil + Reused Coffee Grounds + Tech. = Novel Microbial Fuel Cell

Abstract

Objectives/Goals

The objective of this experiment was to see that if a different ratio of soil to coffee grounds and adding a capacitor or resistor would make the battery applicable to the alternative a renewable energy world.

Methods/Materials

In the experiment I had 1 control and 10 manipulating variables.The independent variable is the ratio of soil to coffee grounds. The dependent variable is the amount of voltage and ampere it produces. I had (100% soil,add 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% coffee ground and 100% coffee ground). Then I put these different ratios into eleven separate jars. I checked the moisture of each jar and checked to make sure if the moisture was the same level. I also checked the PH. of the eleven different jars. I then added zinc and copper electrodes into every jar and soldered wires onto the electrodes. I also made holes in the jar lids and put the copper wires through them. I then patched the holes with silicon and everyday checked the voltage and amperage using a multimeter and a galvanometer. Also I attached capacitors, resistors, LED lights, and a motor.

Results

The results were 90% soil: 10% coffee ground had the highest voltage overall and 100% coffee ground had the highest ampere overall. It shows that the 100% coffee ground the acidic battery was only high in amperage but the neutral 90% soil: 10% coffee ground battery had high voltage and adequate amperage.

Conclusions/Discussion

My data indicates that my first experiment is partially correct because most of the batteries in the 50% to 100% soil (50%-0% coffee ground) have a high voltage of over 0.9 and 1 volt but not all of these have high amperage. 100% coffee ground has the highest amperage. Based on what my data indicates my hypothesis is correct too because when I connected 3 soil bacteria batteries (MFC) that make 3 volts and 100 micro amps with the 3.3 farad super capacitor it charged for 22 hours. After the capacitor was fully charged I attached it with a motor. The motor spun for about 23 seconds. When it tried using NPN and MOSFET transistors it worked but didn#t increase the amperage very much. When I attached 2 or 3 90% soil 10% coffee ground batteries together with a resistor it lit up a LED, clock, and low wattage electrical items. My overall conclusion was that this project could be applicable in the future when new technology comes out that turns low amperage batteries to high amperage batteries.

Summary Statement

MFC and an application to renewable energy.

Help Received

Mother helped order capacitors. Father soldered copper wires to electrodes. Mr.Tyler answered questions I had. Starbucks Coffee gave me a lot of coffee grounds.

Preliminary