CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)

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Project Number

S1811

Project Title

A Little Color to Lighten the World Up: Can We Increase Solar Cell Efficiency by Excluding Different Types of Light?

Abstract

Objectives/Goals

The goal is achieve the optimal amount of efficiency from harnessing solar radiation by altering which wavelengths of light in the electromagnetic spectrum are allowed to pass through the filters-therefore being absorbed by the solar cell and converted to clean, usable electricity.

Methods/Materials

Materials: 4 floppy disks, 5 Educational Solar Energy Kits (model 689), cellophane wrap in the colors primary blue, red, yellow, and clear, protractor, 2 Vernier LabQuest devices with portable chargers, 5 differential voltage probes, and a table with the height of 47 cm. Procedure: Make a series of silicon solar cells to form 5 panels composed of 4 cells each. Cover all with 2 filters that are specified from cell to cell that allow only certain light through to be absorbed. The independent variable is the type of filter: red and blue to let through yellow light, clear-clear to be the control, floppy-disk filters to only let infrared through, yellow-blue to let wavelengths that make up red light, and red-yellow to allow blue light to pass through by reflecting red and yellow light. The panels are wired to differential voltage probes to measure the direct current (DC) of the conversion of solar energy to electrical measured in volts (the dependent variable). On a sunny day, the experimenters took measurements for about two hours in 75 degrees Fahrenheit weather. Multiple sample trials were taken, prior to the experiment run consisting of 32 trials, to test if the solar panels are active. Then record the statistical mean for each of the 5 solar panels for 32 one min. intervals.

Results

Panel A covered by two clear filters results in the largest voltage output. Panel F covered by red and blue filters was the next highes, and Panel B, covered by yellow and red filters follow suit. The fourth best was Panel E, covered by yellow and blue filters. Panel D, covered by and infrared filter and a clear filter, had the least electrical output.

Conclusions/Discussion

The hypothesis is invalid possibly because the filters were too thick and varied in density, the solar cells were not sensitive enough or were too old, or the exclusion of other forms of radiation decreases the absorption of solar energy therefore decreasing electrical output.

Summary Statement

Infrared, clear, and colored filters were used to determine if excluding certain wavelengths of light increase silicon solar cell efficiency.

Help Received

The Milspec Heat-Treating Company for heating the silicon wafers to 1933 degrees Fahrenheit. Mrs. Wagner for the Solar Energy Kits, use of Lab Quest devices and Differential Lab Probes. Mr. Pittman for the solar panels. Laura Yu#s dad for making the stand/backing for the display board.