CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J1211

Project Title
Edison's Bright Idea: Which Filament Produces Visible Light for the Longest Amount of Time?

Abstract

Objectives/Goals
The purpose of my experiment was to determine if the type of filament an incandescent light bulb has affects the length of time it would produce visible light. I hypothesized that of the six filaments tested (steel, nichrome, copper, brass, carbon, and tungsten) the tungsten filament would produce visible light for the longest amount of time.

Methods/Materials
The independent variable in my experiment was the type of filament used in an incandescent light bulb. The dependent variable was measured by using a stopwatch to record the amount of time the filament produced visible light, if any. In order to test each filament, I constructed an incandescent light bulb by mounting a clear plastic cylinder with a rubber stopper at each end to a wooden board. Two clips were suspended from the top stopper to hold the filament inside the cylinder. On the top of the same rubber stopper, test leads connected the light bulb to two 6-volt lantern batteries connected in parallel to produce a 12-volt direct current (DC) circuit. The installation of a knife switch provided ease of use and safety for turning the light bulb off and on. After the installation of each filament, air was extracted from the light bulb assembly through a small hole in the top stopper in order to produce a vacuum. Each of the six filaments was then tested seven times.

Results
After the testing was completed, the length of time each filament produced visible light was then averaged over the seven trials to produce the results. The resulting averages were as follows: tungsten - 33.101 minutes, nichrome - 28.729 minutes, steel - 15.667 minutes, brass - 8.8 minutes, copper - 4.509 minutes, and carbon - 2.052 minutes. Several trials produced no visible light although a few trials using the tungsten filament needed to be stopped before the light died out to prevent the batteries from overheating.

Conclusions/Discussion
The results showed my hypothesis to be correct. The average length of time the tungsten filament produced visible light was longer than the other five filaments. If I were to perform this experiment again, I would use a converter to convert alternating current (AC) into DC power so the voltage would remain constant throughout the experiment, batteries would not heat up nor have to be replaced. Another alternative would be using a spectrometer to determine the frequency the light produces.

Summary Statement
This experiment was conducted to determine which of six light bulb filaments (steel, nichrome, copper, brass, carbon, and tungsten) in an incandescent light bulb would produce visible light for the longest amount of time while in a vacuum.

Help Received
My mom bought the materials, assisted in extracting the oxygen from my light bulb, and helped design my board. My grandma let me use her computer with all of the printing supplies necessary.