

Does the material used in a circuit affect the voltage of an electric current?

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What am I researching?

Does the material used in a circuit affect the voltage of the electrical current? For my experiment, I am going to further explore the relationship between the resistance of a circuit, and the current of a circuit. I can do this by changing the material in the circuit, which will change the resistance, and recording how it affects a light bulbs brightness.

My Hypothesis

I predict that even though most of the materials that I test will conduct electricity, the brightness of the light bulb will change depending on the resistance of each material. I think that the more resistance that the material has, the more that it will slow the electrons passing by, and therefore affect the current, which will change the brightness of the light bulb.

Research & Preparation

I had no prior knowledge with anything to do with electricity and circuits so the first thing I had to do was research so I understood the topic. Using books, I found out the relationship between current, voltage and resistance which helped me figure out what I was measuring, why I was doing it, and how I was going to do it. I also had to learn many new skills for example, learning how to measure voltage or even how to create a circuit, which I am sure are going to be helpful in the future. I then gathered my materials and began to set up my experiment...



Materials

To create the circuit, I used:

- 2 Negative electrical clips & 1 positive clip
- A battery pack
- An electrical switch
- At least 5 different materials to test on (I used gold, silver, titanium, graphite, and stainless steel).
- A light bulb

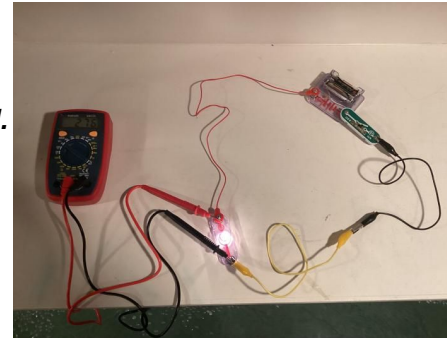
To measure the results I used:

- 1 multimeter
- 1 Lux meter
- 1 Camera



Procedure

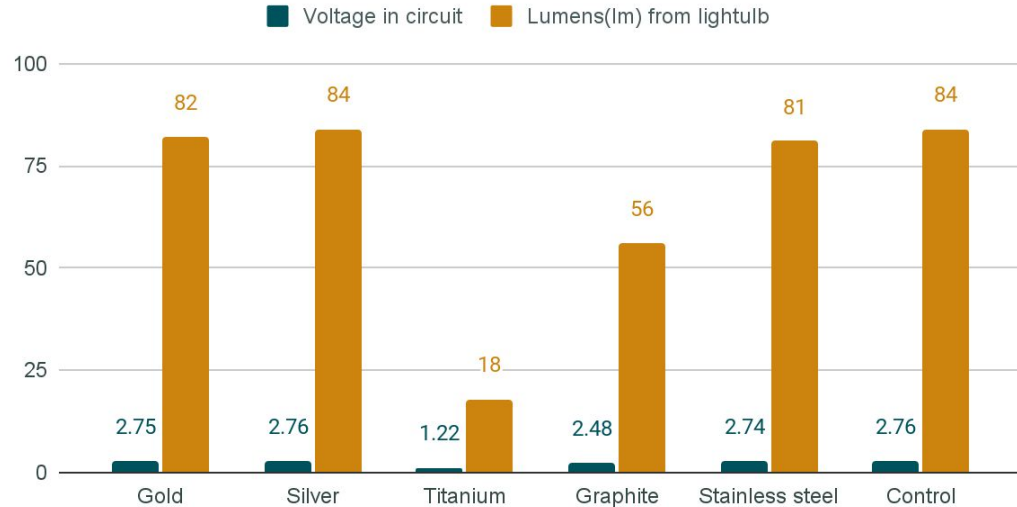
1. ***Gather resources and find an area free of water or anything that could start a fire.***
2. ***Next, build the circuit by connecting a negative electrical clip to a battery with a switch in between. The other side of the clip should be connected to the material or coin being tested.***
3. ***Then, use another negative clip to connect the other side of the material to the light bulb. Finally, to complete the circuit, use a positive clip to connect the lightbulb back to the battery, this should form a circle and look like the image below.***
4. ***After building the circuit, grab the multimeter and connect each port it to either side of the light bulb.***
5. ***Turn on the circuit using the switch and record whether the light bulb turns on and compare the brightness to the control.***
6. ***Write down all the results shown on the multimeter and use a lux meter to measure the brightness of the light bulb for each test.***
7. ***Turn off the circuit and swap the material by unclamping it and replacing it with the next material.***
8. ***Continue to test the materials until you have recorded the results of every material you have.***
9. ***Clean up and make sure to take pictures of the tests.***



Experiment Data

These are the numerical results from my experiment.

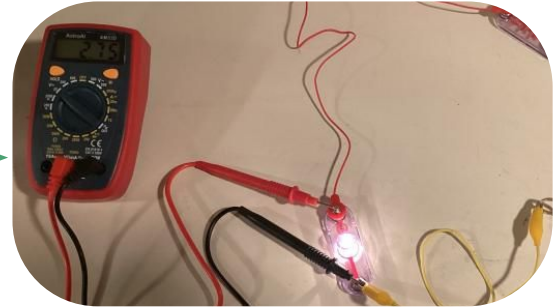
Results



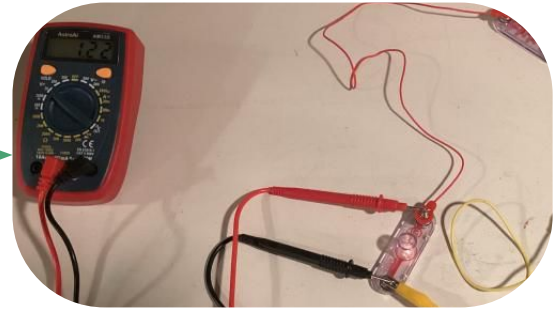
Summary of the results

The brightness of the light bulb will change, but only if the difference between the resistance is big, which is similar to my original hypothesis. I thought that the light bulb would get dimmer if the resistance got higher and based on the experiment, it was correct, but unless the resistance is a lot higher, then the difference is barely noticeable.

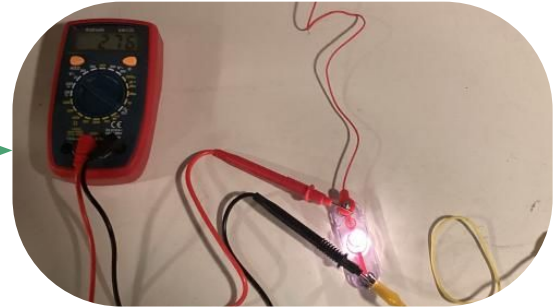
Gold



Titanium



Control



Each material had its own resistance, which according to Ohm's law, will either decrease or increase the voltage of the circuit as the current stays constant. This is useful information to electrical engineers and is put into consideration when designing electrical devices.

Analysis

Conclusion

The results from my experiment have helped me further understand how much a material can impact an electric current as my initial hypothesis was correct, but lacked explanation. After completing the experiment, I have understood why and how the materials actually made a difference to the light bulb which is something really important to know if you are working with any electrical components.

My Future steps

In future experiments, I could dive even further into the topic and measure the current. Then that would allow me to use Ohm's law to find the resistance without measuring it. I could also test other materials that aren't metals to see how they react.

