MATERIALS RESEARCH LABORATORY
the innovation engine for new materials
UC Santa Barbara

Science Teacher Workshop 2012
"Graphene" session

"Business card flashlight"

Electrically conductive paint is great for experimenting with circuits and learning about electronics. Here we will use it to make a small circuit with a battery, switch and LED. This water based conductive paint ("Bare Paint") is non-toxic and conducts electricity through small particles of graphite.

Materials

Business card
Conductive Paint
LED
Button Battery
Battery holder
Paintbrush

Procedure

1. Prepare your button battery by inserting it into the battery holder – this can be done later but it can take some force to insert it. Note which prong of the battery holder corresponds to the + side of the battery. This will be important for later.
2. Create your switch by cutting a small strip into the side of the business card. It will be messy to cut through wet paint and you don't want the switch on until the paint is fully dry, so do this now.
3. Fold over the two prongs of the battery holder so that they rest on the flat surface of the card. Carefully place these two prongs onto a dab of paint on the card – you want these dabs of paint to make good contact with the battery holder and also be visible on the business card.
4. Paint your circuit – apply strips of paint on either side of the card, painting over the "switch" you cut into the card. The paint leading from the + and – sides of the battery should never touch.
5. Fold your switch up and cover the edges of the tab well in paint.
6. Using paint, join the longer leg of the LED (+) to the strip of paint which corresponds to the top (+) side of the battery.
7. As the paint dries, it will glue the battery and the LED to the card (however it is paint and not glue, so handle carefully). Leave the switch folded up while its drying. The resistance of conductive paint drops as it dries, so allow it to fully dry before using, this could take hours or even overnight.

Discussion

What are some other ways to make a switch?
What affect will applying wider or narrower strips of paint have on the circuit?
What will happen if we try to make a circuit using the same battery on a larger surface?

related standards:

grade 7 #7, grade 8 #9: investigation and experimentation
physics grade 9-12 #5 esp. a,b,c "Electric and Magnetic Phenomena"

RESOURCES

If you don't have a battery holder you can wrap the outer edge of the battery with a ring of electrical tape to prevent the paint from creating a short circuit across the top and bottom surface of the battery (which should not be a safety issue but is damaging to the battery).

Conductive Paint projects (see "tutorials" and "community")
http://www.bareconductive.com

Make your own conductive glue
http://www.instructables.com/id/Make-Conductive-Glue-and-Glue-a-Circuit/

"Paper apps" PhD project: "applications for paper based printed electronics"
http://productresearch.dundee.ac.uk/?p=576

Bare conductive paint and other supplies available at inventables.com and sparkfun electronics

Inexpensive parts from "Jameco electronics"
CR2032 battery holder: p/n 355434
inexpensive CR2032 battery: p/n 14162
inexpensive LED: p/n 94511