Exploring Materials—
Graphene

Can you make the world's thinnest material?

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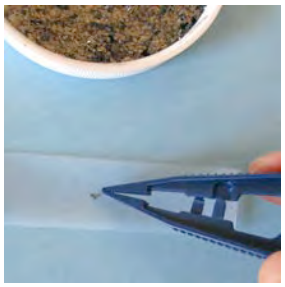
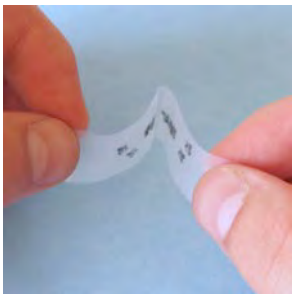
Exploring Materials—Graphene

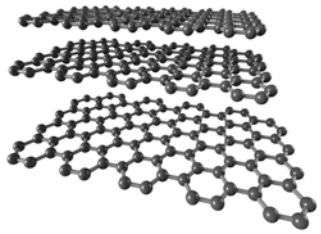
Try this!

1. Take a piece of tape about 3 inches long. Fold over the two ends so you have small, non-sticky tabs to hold.
2. Use the tweezers to put a flake of graphite on the sticky side of the tape.
3. Fold the tape in half over the graphite and peel it apart again. Do this several more times.
4. Stick your tape onto a white card. What do you see?





What's going on?



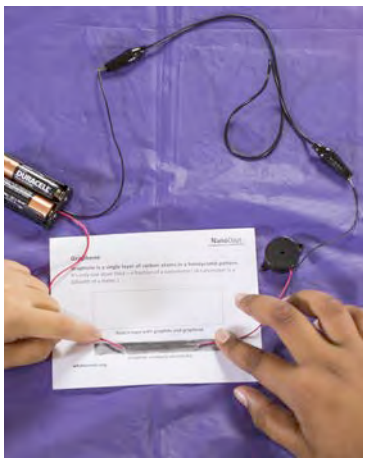
Graphite

You've made very thin layers of graphite—and maybe even some graphene, the thinnest material that exists! Graphene is a single layer of carbon atoms arranged in a honeycomb pattern.

You started with a flake of graphite, which is a mineral made of many layers of graphene stacked on top of each other. Graphite is the material in pencils, commonly called "pencil lead." This simple technique for making graphene from graphite and tape—plus very insightful measurements of its properties—won Andre Geim and Konstantin Novoselov a Nobel Prize in Physics in 2010!

Now try…

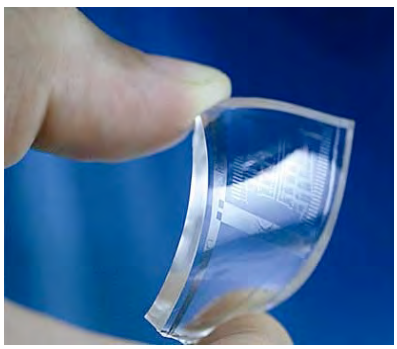
1. Use the pencil to color in the box on your card. Be sure to fill it in completely. You're creating a thin layer of graphite.
2. Touch the two wires to the layer of graphite. What happens?
3. Now, take a look at the printed fabric. Do you see any wires? Try touching the two wires to the printed fabric (on the ink!) What happens?



What's going on?

The buzzer sounds! The graphite on the card conducts electricity, completing the electrical circuit. The design on the fabric is printed with ink that contains graphene nanoplatelets—tiny stacks of graphene. Just like the graphite, these nano-sized particles of graphene also conduct electricity.

How is this nano?



Flexible graphene circuit

Graphene is a single layer of carbon atoms arranged in a honeycomb pattern. Graphene is only one atom thick—that's a fraction of a nanometer! (A nanometer is a billionth of a meter.)

In the field of nanotechnology, scientists and engineers make new, nano-sized materials and devices. Graphene has a lot of potential in nanotechnology because of its useful properties: it's flexible, super-strong, nearly transparent, and conducts electricity. The graphene ink on the fabric can be used to make flexible, wearable circuits. Just imagine, you could charge your phone by plugging it into your shirt! Computer chip manufacturers are developing circuits from graphene, by modifying it to make it a semiconductor. One day, graphene could be used to make see-through, bendable electronic displays, and tiny, fast computer chips.