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

Science Teacher Workshop 2012
"Graphene" session

Emerging technology: Graphene

The 2010 Nobel Prize in Physics was awarded to researchers who isolated and investigated the properties of single layers of graphite, also known as graphene.

Graphene is a sheet of Carbon atoms arranged in a hexagonal pattern - it is just one atom thick. Three million sheets of graphene on top of each other would be 1mm thick. Graphene is a good electric conductor and is incredibly strong. It has a wide range of possible applications!

In this activity you will produce thin layers of graphite – possibly even graphene. Other methods of producing graphene exist but this technique is identical to how the Nobel Prize winners produced graphene! This is referred to as the "drawing method" of producing graphene.

Activity: isolate graphene from graphite

Materials
Sheet of paper with a drawn graphite pad – apply enough graphite so that there are small loose bits of graphite (draw using soft pencil lead, the softer the better as clay is added to pencil lead to make it harder)
Transparent adhesive tape ("scotch" tape)
Tweezers

Procedure
Fold over the ends of a 2-3 inch section of tape to give you something to hold onto. Using the tweezers place a flake of graphite onto the tape. Fold the tape over the graphite and peel it apart. Repeat. Stick the tape onto a white paper. What do you see?

Discussion
What are some possible limitations of this method?
Note that true graphene layers are nearly transparent. What sorts of advancements or technologies could be possible from this advancement?

Related standards:

- grade 8 physical sciences #3: structure of matter (structure of graphite/graphene)
- grade 7 #7, grade 8 #9: investigation and experimentation
- physics grade 9-12 #5 esp. a,b,c (conductive paint, graphite potentiometer, conductive Velcro/cloth).
- CA chemistry standards grade 9-12 #1 (esp. b, graphite as semi-metal and electron mobility), #2 (esp. a, chemical bonds discussed using conductive graphite activity)

Resources

Graphene research is undergoing rapid advancements – a source of news on the field:
http://www.sciencedaily.com/articles/matter_energy/graphene/

Buy "kish" graphite (a pure form of graphite in large flakes):
https://graphene-supermarket.com/Graphene-Kit-Beginner-s-Value-Package.html