SUPER COOL

STUDENT WORKBOOK



GETTING TO THE POINT

The ice spikes weren't what you were expecting, but were a result of crystal formation. In this activity, you will investigate the properties and structure of crystals and how they impact society.

LEARNING GOALS:



CIVITY

I can gather information about the production and use of materials used in nanotechnology applications to explain how their nanoscale structures (including crystal structures) determine their properties.

I can investigate to show that combining two components with different temperatures in a closed system result in thermal energy becoming more evenly distributed.

CRYSTAL SPIKES

WHAT YOU NEED:

FROM THE KIT:

- Aluminum pie plate
- Black construction paper
- Epsom salt
- Flask

OTHER ITEMS:

- Flavoring (optional)
- Food coloring (optional)
- Heat source for boiling water

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- Scissors
- Water



WHAT TO DO:

1. Cut a circle out of the black construction paper to fit the bottom of the pie plate.

2. Put the construction paper in the plate.

SAFETY!

WARNING! Boiled water can cause burns to skin. Be careful not to touch boiling water or hot appliances. Avoid spills by using a stable container and surface.

- 3. Boil water.
- **4.** Pour 2 tablespoons of Epsom salt into the flask and fill it with water to the 40 mL line.

5. (optional) Add two drops of food coloring to your solution if you want a more colorful experiment.



There are three common shapes of nanoparticles that are commonly utilized, including:



Cells are labeled with a magnet that then allows us to separate them from cells without the magnetic marker

While size is one important property of nanoparticles, other unique properties include

- lowered phase change temperatures
- increased mechanical strength
- different electrical conductivity
- self-purification
- crystalline structure

So, how does crystalline structure impact nanoparticles? Crystalline structures occur when a material is in solid form. Nanoparticles have an ideal number of atoms that results in a stable configuration and specific structure, and most nanoparticles come from metals, such as silver, nickel, and carbon. Knowing the crystalline structure of a material allows us to determine the number of atoms per particle required to produce the most stable nanoparticles.

Although nanoparticles assist us in many ways. there are potential health concerns raised about this newer technology. As you already know, nanoparticles are similar in size to human cells.

The concern is that the size of nanoparticles makes them easily absorbed by the body. While small amounts of nanoparticles absorbed by the body are expected to be harmless, large quantities of nanoparticles made from certain materials could become toxic.

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To further investigate this issue, the Environmental Protection Agency (EPA) has started the National Nanotechnology Initiative.

Nanotechnology is also used in the food and health industries, and is expected to increase in its importance within those fields. Eventually, it is thought that there is the possibility to one day develop foods completely from nano particles. This concerns many as they feel this is the next step following genetically modified foods. The goal with the health industry is to be able to administer medications with nano-capsules to better target cellular diseases.



1. What state of matter was the heavy whipping cream in when you began? What about when you were finished? What phase change occurred?

2. For the heavy whipping cream to change phase, something was removed from it. What was it?

3. The heavy whipping cream was warmer than the ice to begin with. What happened to the thermal energy in the heavy whipping cream?

4. Why was the salt added to the ice?

5. Why did the outside of the bag get wet?

6. Pretend that the bags from the ice cream experiment were an isolated system. In the diagram, label which bag has more and which has less thermal energy. Then, draw an arrow to indicate where the thermal energy goes.





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Kit	SU-SPRCOO
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