Topic:
Chemistry

Crystal Gardens **Primary Audience: 3rd – 5th**

Description: This experiment produces crystals from charcoal and salt.

Key Words: Chemistry, Salt, Crystals

Materials:
- Water
- Non-iodized table salt
- Bluing (available in the laundry detergent section of supermarkets)
- Non-foaming regular ammonia (available in the cleaner section of supermarkets) *CAUTION: Keep ammonia away from your eyes and nose*.
- Lump of regular charcoal (do not use easy-light or quick-light charcoal)
- Plastic bowl (like that used for margarine)
- Food coloring

Instructions:

Make the following Basic Solution with adult supervision:
- 6 tablespoons water
- 6 tablespoons salt
- 6 tablespoons bluing
- 2 tablespoons ammonia

Follow the instructions below for your choice of experiments:

COAL FLOWER:
Place the piece of charcoal the plastic bowl. Pour the basic solution around the charcoal, but not on it. Dot the charcoal with drops of food coloring. Set in a place where they will not have to be disturbed or bumped. Soon coral-like crystals will appear and spread over the charcoal. They will grow to a height of nearly 1/2 inch, and it will last for many days.

CRYSTAL GARDEN:
Place several pieces of broken lumps of charcoal in the plastic bowl. Do not overcrowd the dish, and make sure that the pieces do not touch the outer edge of the dish. Pour the basic solution over and around the pieces of material. Dot the pieces with drops of colored ink or food coloring. Set in a place where they will not have to be disturbed or bumped. Crystals will begin to form soon.

What's Going On?

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Crystals are a highly organized form of matter. Their atoms are arranged in a very definite location in space. Some crystals form over long periods of time, like diamonds; some over short periods of time, like the salt crystals in your gardens. Crystals usually need something to form around to start the growth process. This "something" comes from the bluing. Bluing contains a dye pigment called Prussian Blue that the salt crystal forms around. As the basic solution evaporates, it leaves behind tiny crystals of salt. The regular ammonia you added is ammonia gas dissolved in water. Ammonia evaporates more quickly than water, so it speeds up the re-forming of the crystals.

The salt re-crystallizes quickly, so the resulting crystals are quite small. If you could look at the white material that forms on the salt with a very powerful microscope, you would see very small cubes, proving that what you are looking at is, indeed, a crystal. As long as there is liquid in the bowl, it will continue to move up through the charcoal, causing new crystals to form on top of the existing crystals.

Relevant Ohio Science Content Standards:
Physical Science: 4.1, 12.1