



California State University of Bakersfield, Department of Chemistry

Chemical Garden



Standards:

4-ESS3-1 Cause and Effect: Cause and effect relationships are routinely identified and used to explain change.

2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

5-PS1-3. Make observations and measurements to identify materials based on their properties.

Introduction:

In this experiment you will make a Chemical Garden or Crystal Garden. You will explore Chemistry by observing the cause and effect of adding different metal salts in a solution which lets the rocks/salts grow into magical-looking chemical towers within a day. The different types of salts grow in diverse ways and you will be able to see how they are affected, and additionally you will learn the properties that these metals possess.

Materials:

- beakers or glass containers
- Sand
- Distilled Water
- White- calcium chloride (found on the laundry aisle of some stores)
- White- lead (II) nitrate

This material is based upon work supported by the CSUB Revitalizing Science University Program (REVS-UP) funded by Chevron Corporation. Opinions or points of view expressed in this document are those of the authors and do not necessarily reflect the official position of the Corporation or CSUB.

- Purple- manganese (II) chloride
- Blue- copper (II) sulfate (used for aquaria and as an algaecide for pools)
- Red- cobalt (II) chloride
- Pink- manganese sulfate
- Orange- iron (III) chloride
- Yellow- iron (II) chloride
- Green- nickel (II) nitrate

For Sodium Silicate/Water Glass:

- Silica gel beads (crushed)
- Sodium hydroxide
- Water

Safety:

- Always have an adult with you to help you during your experiment.
- Always wear eye protection and gloves when doing chemistry experiments
- Additional safety info for your experiment, if any

Procedure:

1. Wear proper safety gear, which includes gloves.
2. In a beaker heat 32 g of sodium hydroxide in 80 mL of water.
3. Once the sodium hydroxide is dissolved, slowly add the 48 g of crushed silica gel beads. Heat the solution between additions. If the crushed beads won't dissolve, add a little more water to the solution. You now have sodium silicate or water glass.
4. In a separate beaker/jar place a thin layer of sand on the bottom of the container to make the foundation for the garden.
5. Mix 100 mL of the sodium silicate solution with 400 mL of distilled water. This creates the solution in which the crystals will grow.
6. Pour the sodium silicate solution in the container with the sand.
7. Add small amounts, gradually, of crystals or chunks of the metal salts.
*If you add too many 'rocks' the solution will turn cloudy and immediate precipitation will occur. A slower precipitation rate will give you a nice chemical garden.

The crystals are soft and fragile- take care with movement of the jar.

Data and Observations:

Record your observations here

Questions:

1. What salt grew the fastest?
2. Which salt developed more?
3. Was there any color changes?
4. What are the usual shapes?

References:

1. "Make Your Own Magic Rocks with This Fun Chemistry Demonstration." *About.com Chemistry*. N.p., n.d. Web. 22 July 2014.
2. "How to Make Sodium Silicate or Water Glass." *About.com Chemistry*. N.p., n.d. Web. 22 July 2014.