

2nd Place Winner
Structure of Matter
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Solution Chemistry

Grade Level(s): Grades 1-6

Content Topic(s): Mixture (solutions)

Materials:

- 2 quart saucepan or larger
- 3 cups of tap water (heated)
- 1 pipe cleaner (cut into thirds)
- Cotton string about 16 inches long
- Measuring cup
- Grow container (clear plastic quart take-out soup container is ideal)
- Pencil
- 1 cup of borax (available in the laundry aisle of your grocery store)

DESCRIPTION:

In this activity, students make a snowflake window ornament from a supersaturated solution of borax.

OBJECTIVE:


Students will learn about supersaturated solutions by making their own useful supersaturated solution.

OBSERVATION & BACKGROUND:

A supersaturated solution contains more solute than can be dissolved at a certain temperature. A supersaturated solution is made by heating the solvent (in this case water), and dissolving the solute (borax) at the higher temperature. When the temperature of the solution decreases, there is too much borax dissolved in the solution.

If a seeding device (the pipe cleaner snowflake) is placed in the supersaturated solution, crystals will form on the pipe cleaner as the borax comes out of the solution. This will occur within 24 hours.

EXPERIMENTAL PRECEDURE:

1. Boil three cups of tap water in the saucepan.
2. While the water is heating, cut a pipe cleaner into thirds (depending on the grade level, this could provide good practice in measuring and dividing).
3. Twist the three pipe cleaner pieces together to make a snowflake. 
4. Wrap a string around each arm of the snowflake and tie the beginning and end pieces of the string together, leaving about six inches of string to tie onto a pencil. The pencil will lie across the top of the grow container.
5. When the water boils, remove it from the burner and pour the borax into the water (half at a time) and stir it with a spoon until all of the borax dissolves.

***CAUTION: The liquid is hot, either pour the liquid for the students or warn them not to splash it on themselves.**

6. Transfer the supersaturated borax solution to the grow container that can sit overnight.
7. Place your snowflake into the solution so that it is completely submerged, but does not touch the bottom or sides of the container. Suspend it from a pencil across the top.
8. Let the snowflake sit in the solution overnight.
9. Remove the snowflake and let it dry on a paper towel.
10. Examine and draw the shape of the crystals.
11. The snowflake can be hung on a holiday tree or in a window and it can be saved for future years.

***CAUTION: Students should wash their hands after handling their snowflake and the borax solution. Keep hands away from eyes and face. Children and pets should not eat the borax crystals.**

MODIFICATIONS OR EXTENSIONS:

Extension 1

Rock candy is created in the same manner from a supersaturated solution of sugar water. You will need two cups of sugar for each cup of water. Do not use pipe cleaners. Use a cotton string and make sure the string is clean. Students will boil the water, dissolve the sugar, and place the string into the supersaturated solution. Crystals will take about a week to form. Students may eat their rock candy.

Extension 2

Reusable liquid instant hot packs (available at local pharmacies) are supersaturated solutions of sodium acetate. Show students that when you click the disk, it releases seeds that start the crystallization of the extra solute, and the heat pack instantly turns into a solid. This process releases heat.