EASY (AND CHEAP) CRYSTAL GROWING

Barbara R. Thomas

Purpose

Everyone is fascinated by making crystals. It's FUN! The students get to watch the progress of the growing crystals and they can observe that all the crystals have the same specific shape.

Definitions

Mineral - a naturally occurring, inorganic substance with a fixed chemical composition and an ordered internal structure.

Crystal - an orderly three-dimensional arrangement of ions yielding a arrangement of crystal faces with a definite geometric relationship to each other. What this means is that crystals have faces in groups of 2, 3, 4, or 6 and that the angles between similar faces are always the same.

Halite - table salt, the mineral form of sodium chloride (NaCl).

Isometric - one of several possible crystal forms, all the parts of the crystal have equal (iso...) measurements (...metric). A cube is isometric.

Teacher Information

This exercise grows salt crystals, crystals of the mineral halite (NaCl). The growing process is technically an easy one. You have to make a saturated solution of table salt and then let the solution sit around and evaporate. What you are doing is dissolving crystals of halite and then Evaporating the water and crystallizing them again. If you look at table salt with a magnifying glass, you will see that all the grains are tiny cubes. The crystals that you will get will also be cubes, but with any luck larger. Notice that the crystals, have flat faces and that the angle between the faces are right angles (90^o between the faces).

Equipment

Evaporating dish - as cheap as possible, disposable aluminum pie plates work nicely, 8 oz. Cool Whip containers, or anything that will hold a cup or more of warm water one inch deep.

Table salt - any kind.

Mixing container - peanut butter jars (especially the plastic ones) make excellent ones.

Something with which to stir.

Magnifying glass (optional).

Student Exercise

Pair the students up, three in a group is the most you want. Have each pair stir salt into warm (not hot enough to burn you) water in the mixing jar, use 1 cup for an 8 oz. Cool Whip container and 2 cups for a pie dish (they can do the mixing in the evaporating dish, but I bet they make a mess). This step seems to the students to take forever, have one student do the stirring, the other add the salt, and have them switch jobs. Add salt in small amounts, a teaspoon at a time, especially at the end, and stir after each addition until the salt disappears. When a few grains remain no matter how much one stirs, the solution is saturated. The solution may turn milky, making it hard to see the grains. In this case, look at the bottom of the mixing jar from underneath and see if you can see undissolved grains. Put your evaporating dishes in a place where the students might leave them alone. Pour the saturated solution into the evaporating dish. Make sure the solution is about an inch deep. A deep solution will usually give you bigger crystals, but will take a very long time to crystallize. Leave the evaporating dishes uncovered. DO NOT DISTURB THEM until all the water has evaporated. There may be a crust of small crystals on top of everything, but underneath there should some larger ones (1/8 to 1/4 inch) large enough to observe the shapes. You can take the crystals out of the evaporating dish in order to see them better. A magnifying glass should not be necessary for observation, but adds excitement because it really enlarges the crystals. To really see the crystals, hold the magnifier up to your eye and bring the crystal up to it.

If the evaporation is very fast, you get lots of small crystals because a lot of centers of crystallization form. If the evaporation is very slow, there are not many centers for the crystals to grow on and fewer crystals are growing. The material in solution makes the same quantity of crystals as the salt you stirred in, but they are fewer and therefore larger.

WORKSHEET

Crystals

1) Why do you want to have a saturated solution of salt?

2) Would you still get crystals if you put less salt in the solution?

3) Would the water evaporate faster or slower if you left your solution in the mixing jar? _________________

Why?

4) If the water evaporates slowly, is crystallization faster or slower? __________________

5) If crystallization is slower, will you get larger or smaller crystals? ___________________

6) Look at the crystals and answer the following questions.

How many faces (sides) are there? ____________

What is the angle between the faces? _____________

Are all the faces the same size? _____________

If all the faces were the same size what crystal name would you give these? ___________________

4 faces = tetrahedron
6 faces = cube (hexahedron)
8 faces = octahedron

7) Why do all the crystals in everyone's evaporating dish have the same shape?

ANSWER SHEET WORKSHEET

Crystals

1) Why do you want to have a saturated solution of salt?

If the solution is not saturated the salt will stay in solution.
The solution must become oversaturated before crystals will form. Oversaturated means too much material for all of it to stay in solution.

2) Would you still get crystals if you put less salt in the solution?

Yes, it would just take longer for the solution to become oversaturated.

3) Would the water evaporate faster or slower if you left your solution in the mixing jar? ____**Slower**___

Why?

Because the surface area of the mixing jar is smaller than that of the evaporating dish, so evaporation will be slower.

4) If the water evaporates slowly, is crystallization faster or slower? ____**Slower**________

5) If crystallization is slower, will you get larger or smaller crystals? ____**Larger**_________

6) Look at the crystals and answer the following questions.

How many faces (sides) are there? ____**6**_______

What is the angle between the faces? ____**90 degrees**___

Are all the faces the same size? _**No, unless everything was ideal**__

If all the faces were the same size what crystal name would you give these? __**Cube**_____________

4 faces = tetrahedron
6 faces = cube (hexahedron)
8 faces = octahedron

7) Why do all the crystals in everyone's evaporating dish have the same shape?

Because they are all crystals of halite (rock salt, NaCl) which usually forms cubes. They could have formed octahedra, but usually do not.