Edible Kyber Crystals

Objective:
In the Star Wars universe, kyber crystals are rare, and prized because they were essential to constructing a lightsaber. You can observe how sugar crystals form in this activity.

Difficulty Level:
Easy with help (ages 5-10)/Medium (ages 10-14)
***This project involves using a stove. Be sure that you have an adult's permission and supervision when you use the stove. Sugar solution gets very hot! Be sure not to spill or touch it. If you accidentally get it on your skin, immediately rinse it with cold water and tell an adult.**

Materials:
- Saucepan
- Measuring cup
- Spatula
- 4 wooden skewers
- 4 clothespins
- 5 tall glasses
- 4 different food-coloring colors
- 1 cup water
- 4 cups sugar

Procedure:

1.Measure 4 cups of sugar into a saucepan on the stove, and add 1 cup of water to it. Be sure you have an adult supervising when you use the stove.

2.Turn the stove burner to 'high'. As the sugar and water solution gets hotter, gently stir it with the spatula. What do you notice happening to the sugar? Keep stirring until all the sugar dissolves in the water and you can't see grains of sugar any more.

3.Keep heating your sugar water solution for about 3 minutes. You want the solution to be very hot, but not boiling. There shouldn't be any bubbles forming on the surface of your solution-- turn down the heat if they begin to appear.

4.Turn off the burner and let your sugar solution cool for about 10 minutes. Be sure the handle of the saucepan is turned so it can't be accidentally bumped if someone passes by. Don't leave the solution unattended.

5.Once your solution has cooled, carefully pour it into a liquid measuring cup. Be sure the solution is cool-- if it's too hot, it might crack the glass.

6. Pour 1 cup of dry sugar into a tall glass. Dip a skewer into your sugar solution, and then dip it into the dry sugar in the glass. Let the dry sugar granules coat the liquid solution -- this is creating 'seed crystals' for your kyber crystals to grow on.

7.Pour a little food coloring into each of your four tall glasses. You can try a different color in each glass, if you want to make four different-colored kyber crystals.

8.Pour the cooled sugar solution into each tall glass, and stir it, to mix the solution with the food coloring.

9. Clamp a clothespin across each skewer horizontally, and then lower a skewer into each glass. The clothespin will lie across the top of the glass to keep the skewer standing up straight.

10. Put the glasses with the skewers and solution in a cool place where they won't be disturbed. You can check each day to see if there are crystals forming on the skewer.

11. You might discover a crust over sugar has grown across the top of your solution. If this happens, gently break it up with a butter knife or spoon handle, so your crystals will keep growing on the skewer.

12. You should be able to notice the crystals forming and growing larger over time. After five or six days, carefully remove your skewers from the sugar solution. You can let them dry on a plate. Once they're completely dry, you can eat them!

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What's the Science?

You may have noticed that your sugar was made up of tiny grains. Each grain of sugar is an individual crystal. When you stir sugar into a liquid, it dissolves, but as you have seen in this activity, you can make it recrystalize. But how does this work?

It doesn't take a Jedi to explain, just chemistry!

Each grain of sugar is made of molecules of sucrose, arranged in an orderly three-dimensional pattern. When you add sugar to water, the water molecules were attracted to the sucrose, so some of the sucrose so water molecules surrounded some of the sucrose molecules, and began to spread out.

Normally, only a certain amount of a solid can dissolve in water. After that point, no more will dissolve-- you may have seen this if you tried to put a lot of sugar into cold ice tea or Koolaid. When a solution cannot dissolve any more solid material, we say it is saturated.

The sucrose molecules in the water are constantly moving, some of them are dissolving in the water, but others are recombining with other sucrose molecules, to recrystalize. In a saturated solution, the rate of dissolving and recrystallizing is equal. If we want to make the extra sugar dissolve, we need to heat it. The increase in temperature allowed you to dissolve more sugar than you could when the liquid was cold.

As the supersaturated solution was heated, more sucrose molecules broke apart and dissolved, but as it cooled, the sucrose molecules were able to recombine, to form the big sugar crystals you saw in the rock candy.

Explore More:

Put some sugar into a shallow dish, and add enough water to dissolve it. Leave the dish in a safe place and check on it each day until the water evaporates. Now, investigate the dish. What do you notice?

Star Wars Connection

Kyber Crystals were rare crystals attuned to the mysterious phenomenon known as "The Force" in the Star Wars universe. They were used by Jedi and the evil Sith in the

production of lightsabers. As part of their training, apprentice Jedi mined kyber crystals from ice caves. Once a Jedi chooses a crystal, it would assume a certain color, which was reflected in the color of the lightsaber blade. When you watch the Star Wars series, notice how many different colored lightsabers the Jedi have. Are some colors more common than others?

Sith users had to use the Dark Side to modify their kyber crystals, damaging the crystal. As a result, a Sith lightsaber blade is always red.

Most of the lore of kyber crystals was developed for the *Clone Wars* and *Rebels* animated series.

References:

This activity was inspired by an activity in *Star Wars Maker Lab: 20 Craft and Science Projects* by Liz Lee Heinecke and Cole Horton

"The Sweet Science of Candymaking," Tom Husband, American Chemical Society ChemMatters Online, October, 2014

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