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SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH

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Sweet Crystals

Maple syrup tastes great on pancakes, but did you know it has other amazing characteristics? It can form different sizes and shapes of crystals under certain conditions. Heat and cool some maple syrup to see what kind of crystals you can form.

TEKS:

K.1B Observe, record, and discuss how materials can be changed by heating or cooling.

1.5B Predict and identify changes in materials caused by heating and cooling such as ice melting, water freezing, and water evaporating.

2.5B Compare changes in materials caused by heating and cooling.

2.5C Demonstrate that things can be done to materials to change their physical properties such as cutting, folding, sanding, and melting

3.5C Predict, observe, and record changes in the state of matter caused by heating or cooling

4.5A Measure, compare, and contrast physical properties of matter, including size, mass, volume, states (solid, liquid, gas), temperature, magnetism, and the ability to sink or float

4.5B Predict the changes caused by heating and cooling such as ice becoming liquid water and condensation forming on the outside of a glass of ice water

Materials:

- Baking pan or flat tray
- Hot plate or stove
- Large spoon
- Magnifying glass
- Pure maple syrup
- Sauce pan
- Stopwatch (optional)
- Water

How To

1. Before you heat the maple syrup, make a sheet of ice by placing a thin layer of water in a baking pan or tray and keeping it in the freezer until it is frozen solid.
2. Once the water in the baking pan is frozen, heat the maple syrup over medium heat in the saucepan, stirring constantly.
3. Bring the syrup to a boil and allow it to cook, uncovered, until it is very thick and viscous. Keep stirring to make sure that it does not burn.
4. Set out the baking pan with the sheet of ice on the countertop.
5. Use your spoon to drop one dollop of the hot, thick maple syrup onto the ice.
6. Do not touch the dollop —it will still be really hot!

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How To Continued…

7. Watch as the maple syrup cools. Try using a stopwatch to time how long it takes for crystals to form and solidify on the dollop.
8. Observe the shape and length of the crystals. Use a magnifying glass to get a close look at the crystals.
9. What happens when you place a dollop of the heated maple syrup on a room temperature tray?

Why Does it Work?

Maple syrup is a concentrated solution of sugar in water, with many minor flavoring compounds. When it is heated, some of the water evaporates off and the sugar becomes more concentrated. As the water evaporates, the sugar molecules bump into one another frequently because there are so many of them, so close together. Occasionally, when they bump into each other, the molecules end up sticking together. As the heated maple syrup cools, the sugar molecules form crystals. Unlike the sugar molecules in liquid syrup, which are free to float around, sugar molecules in the heated, concentrated syrup form these crystals, which line up and arrange themselves in an orderly and repetitive pattern.

Career Connection:

Food science technicians test and catalog the physical and chemical properties of food to help ensure that they have good taste, texture, quality, and are safe to eat. A food scientist might help develop a delicious new candy, check for bacterial contamination to prevent food poisoning, and test cereal to make sure that nutrition labels are correct.

Resources: http://www.sciencebuddies.org/science-fair-projects/project_ideas/FoodSci_p044.shtml#summary

