



national science week 2024

DIY Science – Crystal Growing

Grow sparkling crystals and explore crystal structure.

Safety

An adult must supervise and assist with using hot water to make the crystal growing solution. Wear safety goggles and avoid Epsom salts coming into direct contact with skin. If skin contact occurs, wash the area thoroughly with water. Wash hands after completing the activity. Keep crystal growing activities out of reach of young children. After completing the activity, wash all kitchen equipment thoroughly in warm soapy water.

What you need

100 g 'Epsom salts'
(magnesium sulphate heptahydrate, $MgSO_4 \cdot 7H_2O$)
Epsom salts is available from chemists or the bath product section of large supermarkets.
You will also need a kettle, tablespoon, measuring cup, heat-proof glass jar or small bowl, metal spoon, 2 small shallow dishes, a lid or plastic film to cover one of the dishes, and a refrigerator.



What to do

1. Boil water in the kettle and leave it to cool for 5 minutes.
2. Use the measuring cup to add 50 mL of the boiled water to the heat-proof jar.
3. Add 5 tablespoons of Epsom salts to the jar.
4. Use the metal spoon to stir the solution for about 3 minutes until almost all of the Epsom salts has dissolved.
5. Leave the solution to cool for 10-15 minutes.
6. While the solution is cooling, place one piece of Epsom salts in each of the 2 shallow dishes. Epsom salts usually looks like tiny clear crystals. Over time, Epsom salts can have a white powdery appearance.
7. Carefully pour about half of the solution into each of the shallow dishes, taking care to avoid pouring in any of the undissolved Epsom salts.
8. Cover one shallow dish with a lid or plastic film and place the dish in the refrigerator, being careful to place it somewhere out of reach of children and tell other people about your experiment so they know what is in the plastic dish.
9. Leave the other shallow dish at room temperature, somewhere safe where it will not be disturbed.
10. Leave the dishes for several hours or overnight. After a few hours, you should be able to see needle-like crystals forming. The longer you leave the dishes, the larger the crystals will grow, until all of the water has evaporated from the dishes.

Try growing a bigger crystal. Save two crystals from Step 7 and keep the crystals clean and dry. These will act as 'seed' crystals. Repeat Steps 1 to 6. For Step 5, place one seed crystal in each shallow dish and leave the dishes at room temperature for at least 24 hours.



Try using table salt or white sugar if you do not have access to Epsom salts, although the crystals may not grow as big as Epsom salts crystals.

What's happening?

Epsom salts is highly soluble in water. When the solid chemical is added to water, water breaks apart the molecules and the solid chemical seems to disappear into the solution. More of the chemical will dissolve in hot water compared to cold water. In Step 4, adding 5 tablespoons of Epsom salts to 50 mL water makes a 'saturated solution', which means that no more Epsom salts will dissolve in the water. When the saturated solution cools, it can become a 'supersaturated solution' with more chemical dissolved in the water than would have dissolved if the chemical had been added to cold water.

A supersaturated solution is perfect for growing crystals. When the supersaturated solution touches the tiny pieces of solid Epsom salts in the shallow dishes, the dissolved molecules start to attach to the solid chemical. The molecules build up orderly structures which create crystals.

Results

Different chemicals form different crystal shapes. Epsom salts has a 'tetragonal' crystal structure, which is a bit like a stretched cube shape. The arrangement of molecules in a crystal structure determines the shape of the crystals formed by a chemical. Observe some of the crystals you have grown and sketch their shape. Do an online search for the crystal structure of the chemical you used and compare the structure to your sketch.

Chemical name	Sketch of an individual crystal	Diagram from an online search

Did you know?

Gemstones are crystals that do not dissolve in water. For example, emeralds are crystals with a hexagonal crystal structure. The shape of the crystals is based on a six-sided shape. Diamonds are made up of carbon atoms that are arranged in a crystal structure. Diamonds are extremely hard and are used to cut through metals and even through other diamonds.

Find out more

- Compete in a crystal-growing competition run by the Royal Australian Chemical Institute: https://raci.org.au/Web/Schools/Crystal_Growing2.aspx
- Learn about Australian gemstones: <https://www.ga.gov.au/education/minerals-energy/australian-mineral-facts/australian-gems>
- Explore underground crystals by visiting some of the best caves in Australia: <https://www.australiangeographic.com.au/topics/science-environment/2017/10/the-best-caves-in-australia/>