Crystal Coral Reef

Crystals are made of minerals that are arranged perfectly to grow in a form called a crystalline structure. It can take hundreds or thousands of years for some crystals to form under the surface of the earth. In this activity, you will form crystal "corals" in just a few hours!

Duration

Preparation: 10-15 minutes
Crystal Growth: Minimum of 24 hours

Supplies

- Warm Water (adult supervision required)
- Heatproof container (Mug, bowl, or dish)
- Popsicle sticks
- Pipe cleaners
- Spoon
- Sugar (Borax or salt can also be used)

Background

Corals are animals that live in colonies of identical polyps and belong to the phylum Cnidaria, which also contains jellyfish, anemones, and hydra. There are two types of corals: soft coral and hard coral. Hard corals are important reef builders that can be found in tropical oceans. They are called hard corals because they can extract a mineral from the ocean called **calcium carbonate** to form a hard skeleton. When hard corals die, the hard skeletons remain intact. Soft corals do not have a hardened calcium carbonate skeleton, therefore they do not contribute to the growth of coral reefs.

Within hard corals are tiny, marine algae called zooxanthellae (pronounced zoo-zan-THELL-ee). These plant-like organisms capture sunlight and convert it to energy in a process called photosynthesis. The zooxanthellae and hard corals have a mutually beneficial relationship, meaning that both the algae and the coral benefit from one another. The corals provide protection for the zooxanthellae and the zooxanthellae provide nutrient sugars for the coral.

Corals and zooxanthellae are sensitive organisms that require specific conditions to thrive, including the right temperature and water chemistry. Global warming and ocean acidification are two major threats to coral reef ecosystems. When ideal conditions are not met, zooxanthellae will die or leave their coral host in a process

called bleaching. Bleached corals do not die right away, but they are more likely to die of starvation or disease.

To understand how to conserve and protect reefs, Virginia Aquarium biologists work with SECORE, an organization dedicated to conserving corals by developing new methods to assist coral reproduction in the wild. Ongoing projects at the Virginia Aquarium include fostering a coral nursery from sustainably harvested coral and maintaining an aquarium with hard and soft corals in 10,000-gallon aquarium. Grow your own crystal coral reef in this fun activity!

Instructions

1. Glue two popsicle sticks into an "X" shape. Make one per "coral". This will be the stand for the crystals when they're finished forming and ready to be displayed.
2. Bend and twist colorful pipe cleaners to form coral shapes.
3. Prepare solution:
    - Add 3 tablespoons of sugar, salt, or borax PER cup of warm water.
    - Stir the solution carefully until as much solute dissolves as possible.
    - If there are no particles left on the bottom of the container, add another tablespoon and stir.
    - **Keep adding and stirring until none of the solute will dissolve into the water.**
    - *Optional: Food coloring can be added to the solution at this stage to add color to the crystals.*
4. Insert your pipe cleaner coral into the container so that it is upside down. *See picture.*
5. Move the container to a location that is out of the way and will not be disturbed for the next 24 hours.

Over the next few hours, the sugar, salt, or borax molecules will start to settle onto the pipe cleaner corals as the liquid cools. After 24 hours, remove the corals from the solution and allow them to dry. If you want larger crystals, place your coral back into the solution for another 24 hours. If you want to continue growing the crystal corals after two days, make another solution using step 3 and place the crystal coral inside. Just make sure that you will be able to remove the large coral from the container once the additional crystals have formed!

Explanation

A supersaturated solution is one that contains more dissolved material (solute) that can be dissolved by the solvent in normal conditions. Our crystals formed out of a supersaturated sugar, salt, or borax solution. The solution contained so much solute that the liquid appeared cloudy or murky because some of the powder could not dissolve into the water. By mixing the sugar, salt, or borax into hot water, the minerals stayed suspended in the solution longer. Hot water can hold more solute than cold water because when the water molecules move faster and spread out, they make more room for the solute molecules.

As the solution cooled, water molecules moved together, and the solute molecules settled. The molecules bonded together to form crystals at nucleation sites (cracks and bumps) within the container and on the pipe cleaners. Crystals form in unique patterns depending on the shape of the molecule forming them. The crystals in this experiment will continue to grow until the pipe cleaner coral is removed from the solution.

Next time you try this activity, add food coloring to the solution to see what happens to the crystal formation.

Extension

You can also try all three solutes (sugar, salt, and borax) and compare the rate of crystal formation and compare the crystalline structure of each crystal.