Spherification Experiment – Sodium alginate and calcium chloride

Materials

- Sodium alginate solution 1% by weight (prepared)
- Calcium chloride solution 1% by weight (prepared)
- Water
- Large bowl
- Smaller bowl
- Blender or hand mixer
- Optional: Various fruit juices or flavored water (for taste)
- Spoons with rounded bottoms (size will determine the size of your water bubble)
- Safety equipment (gloves, goggles)
- Accessible measuring tools
- Digital scale
- Data recording sheets designed by students

Overall Expectations

C1. analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment;
C2. investigate different types of chemical reactions;
C3. demonstrate an understanding of the different types of chemical reactions.

Specific Expectations

Chemical Reactions
C2.3 investigate synthesis, decomposition, single displacement, and double displacement reactions, by testing the products of each reaction [PR, AI]
C2.6 predict the products of double displacement reactions [AI]
C3.1 identify various types of chemical reactions, including synthesis, decomposition, single displacement, double displacement, and combustion.

Description

This experiment uses a common spherification recipe to create a gel polymer coating around liquid water using sodium alginate, derived from seaweed, and a calcium chloride solution. Keep in mind, that **you will be designing your experiment**. Figure out what question you want to answer with this experiment and modify the procedure to fit that question. You will need to design your data collection tables.

Procedure

1. Using a digital scale measure 1 gram of sodium alginate. Add this powder to 250 mL of water in a small bowl.
2. Use the hand mixer to make sure the sodium alginate is combined with the water. Let the mixture sit for about 15 minutes to remove any air bubbles. The mixture will turn from a white liquid to a clear mixture.
3. Using a digital scale, measure 5 grams of calcium chloride. Add this to 1L of water in a larger bowl. Mix well to dissolve the calcium chloride.
4. Use your rounded spoon to scoop up the sodium alginate solution.
5. Gently drop the sodium alginate solution into the bowl containing the calcium chloride solution. It will immediately form a ball of water in the bowl. You can drop more spoonfuls of sodium alginate solution into the calcium chloride bath but be careful the water balls don't touch each other because they would stick together. Let the water balls sit in the calcium chloride solution for a few minutes. You can gently stir around the calcium lactate solution if you like.
    a. *The time determines the thickness of the polymer coating. Use less time for a thinner coating and more time for a thicker coating. **This could be one way to make a more specific experiment.**
6. Another option is to freeze the sodium alginate solution in molds or an ice cube tray until it is completely frozen. Drop the frozen sodium alginate into the calcium chloride solution.
    a. *This could be another way to change up the experiment.
7. Use a slotted spoon to gently remove each water ball. Place each ball in a bowl of fresh water to stop any further reaction.

Suggestions for Data Collection:

Quantitative Observations:

Size of the spheres after a specified time in the calcium chloride solution.
Size of the spheres after a specified time in open air.
Mass of spheres using different concentrations of the calcium chloride solution.

Qualitative Observations:

Springiness of the spheres after a specified time in the calcium chloride solution.
Springiness of the spheres after a specified time in open air.
Durability of the spheres using different types of solutions. (See the lesson plan for suggested solutions.)