



Curiosity Guide #506

Bioplastics

Accompanies Curious Crew, Season 5, Episode 6 (#506)

Stretchy Gelatin

Investigation #4

Description

This fun investigation will certainly stretch what you know about bioplastics!

Materials

- Gelatin or Agar
- Water
- Glycerin
- Food Coloring
- Stove
- Cooking pot
- Spoon
- Whisk
- Candy thermometer
- Measuring spoons
- Cookie sheet
- Wax paper
- Clay mold, optional
- Marker
- Strips of gelatin bioplastic
- Clear tape
- Ruler

Procedure

1. Cover a cookie sheet with wax paper. Set aside.
2. You will do the following procedure three times in all with variations that are listed in step 12.
3. In a cooking pot, combine 4 teaspoons gelatin with $\frac{1}{4}$ cup water and $\frac{1}{2}$ teaspoon glycerin.
4. Heat the mixture on the stove at medium to high heat, stirring constantly.
5. You may need to whisk the mixture to get rid of the clumps.
6. Add several drops of food coloring.
7. Monitor the temperature of the mixture with a candy thermometer.
8. When the mixture begins to get foamy, at 95 degrees Celsius or 203 degrees Fahrenheit, remove from heat.
9. Continue to stir the mixture.
10. Pour the plastic mixture on the paper or into a clay mold.
11. Repeat the recipe twice more:
 - Make the second sample with twice the amount of glycerin.
 - Make the third sample with half the amount of glycerin.
12. Label each of the three samples on the wax paper.
13. Allow the plastic to dry for 2 days.
14. With clear tape, fasten a ruler to the table.
15. Hold a strip of each of the gelatin bioplastics that you made next to the ruler.
16. Firmly hold one end of each sample. Stretch the other end to see how far the sample can stretch before breaking.

My Results

Explanation

Bioplastics are a natural solution as a kind of plastic that is safer for the environment. In this investigation, each ingredient helps improve the quality of the plastic. The gelatin or agar acts as the polymer chains. The water is the solvent. Because glycerin is a plasticizer, the glycerin creates space between the polymer chains so that the plastic is more flexible and won't be so rigid or brittle. Because glycerin acts like a lubricant, increasing the amount of glycerin increases the flexibility of the plastic. Reducing the glycerin makes the plastic more brittle. How the plastic will be used will determine how rigid or flexible the bioplastic needs to be.

Think about this: All matter, including plastics, is made of molecules. What makes plastics especially interesting is how the molecules work together. If we had microscope eyes, we would be able to see an individual molecule, called a monomer. Now imagine a line of those monomers side by side and linked together, kind of like the beads on a necklace. We call this long molecule a polymer, and that is what makes up plastics. If that long polymer were to get tangled up with many other molecules and linked together, we would be able to make materials that could be stretchy or strong. Wow! Look at that stretch!

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