



Curiosity Guide #506

Bioplastics

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

Fabric Bowl

Investigation #8

Description

A bowl made out of fabric? This I've got to see!

Materials

- Cornstarch
- Vinegar
- Water
- Glycerin
- Spoon
- Spatula
- Stove
- Cooking pot
- Cookie sheet
- Aluminum foil
- Measuring cup
- Teaspoon
- Tablespoon
- Toothpick
- 12 by 12-inch square of fabric
- 2 similar glass bowls
- Scissors
- Cookie sheet
- Wax paper

Procedure

- 1) Cover a cookie sheet with wax paper. Set aside.
- 2) In the cooking pot, measure and combine a ratio of 1 tablespoon cornstarch, 4 tablespoons water, 1 teaspoon vinegar, and 1 teaspoon glycerin
- 3) Stir the ingredients together and heat on the stove over low to medium heat.
- 4) Keep stirring the mixture until it thickens up and changes from white to translucent.
- 5) When the plastic holds its shape when spooned, remove it from heat.
- 6) When the plastic paste is cool enough to touch, completely work the paste into the fabric square so that the fabric is fully saturated.
- 7) Stretch the fabric over one bowl. Press the second bowl inside the first.
- 8) Turn the stacked bowls over and leave them on a cookie sheet covered in wax paper.
- 9) Let the bowl sandwich dry for several days.
- 10) Turn over the bowls and remove the inner bowl.
- 11) Carefully peel back the flaps of the fabric bowl and cut them off with sharp scissors.
- 12) Remove the second glass bowl
- 13) Does your fabric bowl hold its shape?

My Results

Explanation

The starch polymers, when heated with vinegar, leave long, bonded polymer chains, like long strands of spaghetti. The glycerin serves as a plasticizer that lubricates those starch chains. Working the mixture into the fabric spreads out all the starch chains, so when the mixture dries, the fabric is able to hold the shape from the bowl mold.

Although this fabric bowl is flexible, be careful what you put inside it. And remember that water will start to break down those bonds between the molecules, so be sure to put dry things in your fabric bowl.

Think about this: Just like in regular plastics, bioplastics can be formulated to make items that are soft, rubbery, or rigid. Adding crosslinks to polymers can help make the object more rubbery because the crosslinks bond the polymer chains together. Imagine that you need a bioplastic that is really flexible. Then engineers add plasticizers like glycerin to the recipe. The plasticizers push extra space in between the polymer chains, so that the chains can shift past one another more easily, like wet spaghetti noodles! Bioplastics can even turn fabric into a bowl! Amazing!

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