



Making Bioplastics

Theme: Sustainability

Introduction

Using a microwave, youth will create their own bioplastic from cornstarch.

Time needed

- 10-15 minutes

Do & Learn Goal

- Youth will understand that some plastics are made from resources that are limited.
- Youth will learn that some plastics are made from resources that can be replenished or grown.
- Youth will increase their awareness of scientific and engineering solutions that reduce the impact of humans on the Earth.

Background Information

It is no mystery that **plastics** are everywhere - from grocery bags and water bottles to high-tech medical devices and computers. Plastics are widely used because they are durable, lightweight, and easy to produce. The majority of plastics that consumers use every day are created from petroleum (also known as oil). Petroleum is a **non-renewable resource**, meaning it does not replenish itself readily. For example, the world's current oil deposits were formed millions of years ago. As the world's demand for plastics and other non-renewable resources continues to grow, the depletion of these resources is an increasingly important issue. Many scientists and engineers are working to replace traditional, oil-based plastics with plastics made from renewable resources, such as plant matter.

Plastics created from **renewable resources** are often called **bioplastics**. The most common bioplastic in today's market is polylactic acid (referred to as PLA), which is made from corn. PLA is a type of bioplastic that can be composted at industrial compost facilities, meaning it will break down into soil in the proper environment. Even with these new advancements in plastic materials, scientists and engineers are still working on how to create bioplastics that can serve the same purpose as current traditional plastics, yet remain cost-effective. There is still a lot of work that needs to be done to create a truly **sustainable** form of plastic that can meet our everyday needs.

The time scale used when considering if a resource is renewable can be a challenging concept for young people. For example, trees may take many years (which may seem like forever from the youth perspective) to replenish, but if managed properly, trees are considered a renewable resource. It may be helpful to frame these time scales as whether or not they can occur within a person's lifetime.

Renewable materials aren't automatically better for the environment. Factors in the creation, processing, transportation, use, and disposal of an item must be examined to determine the cost/benefits of using such a material.

Do!

Materials:

<ul style="list-style-type: none">• Microwave oven• For each youth:<ul style="list-style-type: none">○ Zipper-top plastic bag (sandwich or quart size bag)○ 1 Tablespoon cornstarch○ 1 Tablespoon water○ 2 drops of corn/vegetable oil○ Food coloring (optional)	<ul style="list-style-type: none">• Locate or provide microwave access for group• Collect materials for each youth. You may have youth measure out quantities themselves or provide each youth with pre-measured amounts.• Watch a video illustrating the basic procedure: https://youtu.be/xLzaI95x5MQ
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Questions:

- Explain what you know about plastics.
- Describe what you think are the advantages and disadvantages of making bioplastic.

Procedure:

1. Each youth should combine the cornstarch and water in a zipper-top plastic bag. Mix the two by squeezing the bag. After mixing, youth should add two drops of corn/vegetable oil. If desired, youth may also add a couple drops of food coloring. Again, mix the contents by squeezing them together in the bag.
2. Youth should close but not fully seal the bag. Leave a small vent in the zipper top opening. Microwave the bag and contents on high for 20-25 seconds. The bag and contents will be hot, use a pad to remove the bag or an adult should remove the bag from the microwave.

3. Let the plastic cool for 2-3 minutes in the bag. After cooling, youth can touch, shape, and play with their plastic! Safety note: Even though the plastic is made from edible materials, youth should not eat or taste their bioplastic.

Reflect

- Describe what you think your bioplastic would be good for.
- Explain how you think the bioplastic you made might be more or less sustainable than other types of plastic.
- Tell us what you think about how the process of making bioplastic might or might not be environmentally friendly.

Learn More!

Tell someone why **you are a scientist** or **teach them a new word** you learned:

- **Bioplastic:** Polymers often made from starch-containing plants, such as corn and potatoes. Many of these bioplastics are compostable.
- **Non-renewable resource:** A resource that is only available in limited quantities and takes a long time to be replenished (for example millions of years).
- **Plastic:** A type of human-made material. Usually made from petroleum or oil (traditional) but plastics can be made from renewable resources like plants (bioplastic); all plastics are polymers.
- **Renewable resource:** A resource that can be replenished, often within one person's lifetime.
- **Sustainable:** Able to be maintained or run continuously.

This activity is part of **Sustainable Polymers: Taking Action to Solve the Challenge of Plastics**, a 4-H STEM curriculum for grades 6-8. Please visit 4hpolymers.org to download the full curriculum.