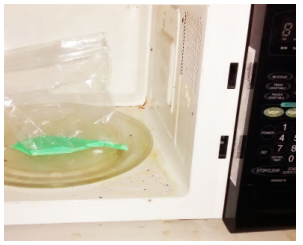
Making Bioplastics

Description:

Common plastic is made from petroleum, a fossil fuel and non-renewable resource. Increasingly, plastic products are being made from biomass which is made from renewable resources, often byproducts of agricultural processes.
In this activity students make a simple bioplastic from corn starch. This lesson also provides an opportunity to discuss the advantages and disadvantages of bioplastics and how we use of our natural resources.

Background:

Bioplastics are a type of plastic made from renewable, biological materials like starches, cellulose, oils or proteins. They generally contain little to no petroleum and therefore are usually biodegradable. When bioplastics are exposed to the environment (sunlight, heat, water, microorganisms) they breakdown into non-toxic compounds like carbon dioxide and water. Additionally, unlike petroleum-based plastics, bioplastics are made from renewable resources. These resources are typically agricultural byproducts, like cornstarch and potato starch, tapioca starch and casein (milk protein). Byproducts in agriculture refers to secondary products created from a crop.



Directions:

1. Divide students into groups and give them the supplies for making their bioplastic. For younger grades, demonstrate the process to the students, asking them to hypothesize at the various stages what will happen and imagine what can be made from bioplastic. Older students can follow the directions and answer the questions on the attached worksheet.
2. To make the bioplastic, place the following ingredients in a plastic plastic bag: 1 tablespoon of cornstarch, two drops of corn oil, one tablespoon of water and 2 drops of food coloring.
3. Seal the bag and gently mix the cornstarch mixture by rubbing the outside of the bag with your fingers until combined.
4. Open the bag slightly, making sure it can vent. Place the bag upright in a microwave oven on high for 20-25 seconds.
5. Carefully remove the bag from the microwave and let it cool for a few minutes. While it is still warm, students can try to form their plastic into a ball. Observe what it does.
6. Have students complete the worksheet, then discuss the experiment. Ask them to describe their plastic; did it turned out different with others; and name three things they could make with bioplastic.

Biodegradeable bioplastic breaking down over time.

Grade Level: 1-7

Essential Skills: 1, 2, 5, 6, 9

NGSS: 1-LS1-1, 2-PS1-2, 3-ESS3-1, 3-PS2-4. 3-5-ETS-2, 4-ESS3-1, 5-ESS3-1, MS-ESS3-5, MS-ESS3-2.
CCSS: RI.1.1, RI.1.7, W.1.7, RI.2.1, RI.2.8, W.2.7, W.2.8, RI.3.1, W.3.2

Social Sciences: 1.12, 1.21, 3.12, 4.13, 5.11, 5.22

Math: MP.2, MP.4, MP.5

Time: Full class period

Materials:
Each group of students making bioplastic will need the following: tablespoon; cornstarch; corn oil; food coloring; water; plastic bag; worksheet

AITC Library Resources:
Check out these materials online at AITC's Free Loan Library:
Instructional Unit: Bringing Biotechnology to Life
Books:
Worms Eat My Garbage
Soul of Soil

More Lessons:
Source Relay
Water Filteration

Vocabulary:
Biodegradable: a material able to break down into harmless products through the action of living organisms

Activity Page

Making Bioplastic

Source: Science in Residence Program

Materials:

Cornstarch	Food coloring
Water	Measuring spoons or containers
Corn oil	plastic bag

Directions: Part 1

1. Measure 15 ml (1 tablespoon) of cornstarch into your plastic bag.
2. Add 15 ml (1 tablespoon) of water to the cornstarch.
3. Add 2 small drops of corn oil to the mixture in your bag.
4. Add 2 drops of food coloring to the mixture in your bag. You can mix two primary colors if you wish.
5. Seal the bag and squish it gently to mix everything together. Make sure your mixture is mixed well.

Describe the mixture in your plastic bag: _____

_____

How does it feel when you slowly squish the bag? _____

_____

Does it feel differently when you squeeze the bag quicker vs. slower? _____

_____

Is your mixture a solid or a liquid? _____What will happen when you cook it?_____

Directions: Part 2

6. Be sure to leave the bag open a tiny bit so that steam can escape. Prop the open bag in the microwave, and microwave your mixture on high power for 20 seconds. **Be Careful!** - the plastic will be hot!
7. Let it cool for several minutes. While it is cooling answer the questions below.

What does your new substance look like? How is it different from the mixture you started with?

_____

_____

If your plastic is cool, knead it with your hands. What does it feel like? Describe its other properties.

_____

_____

What could you make with your bioplastic? What couldn't you make? Why?

_____

_____

What is used to make bioplastic?_____

_____