

## Stick a Fork in It

# Making Bioplastic

### Problem

Which bio-based substrate will create a durable form of bio-plastic?

### Purpose

To develop an inexpensive, durable bio-based plastic made from a renewable source.

**Background** (students research and define the following terms)

Bioplastic	Hydro-degradable
Plasticizer	Carbon neutral
Biodegradable	Photo-degradable
Cellulose	Oxo-degradable
Compostable	Carbon Footprint
Casein	Substrate

### Materials:

Aluminum foil  
Substrates (Soy Flour/Gelatin/Cornstarch/Arrowroot/Pea Starch)  
Beakers  
Vegetable Glycerin  
Graduated Cylinder  
Electronic Balance  
Weigh Boats  
Hot Plates  
Stirring Rods

### Procedure:

Part 1: Making a Fork Handle Mold:

1. Design 3 fork handle molds for each type of substrate. Substrates that are going to be tested:  
Cornstarch, gelatin, soy flour and \_\_\_\_\_ (your choice)  
(possible choices: Pea starch, potato starch, arrowroot, vegan based gelatin)
3. Label each mold.

Part 2: Making of Bio-Based Plastics

1. In a beaker or flask, add the appropriate amounts of chemicals to make the bio-plastic samples. Place beaker on hot plate and heat solution until just boiling. Pour bio-plastics in molds and allow to sit to dry.

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Substrate Source	Water	Substrate Amount	Glycerin
Gelatin	50mL	9 grams	.250 uL
Cornstarch	50mL	9 grams	.250 uL
Soy Flour	50mL	9 grams	.250 uL
(your choice)	50mL	9 grams	.250 uL

### Data: Durability Tests for Bio-Plastics

Characteristics	Gelatin	Cornstarch	Soy Flour	Your Choice
<b>Color &amp; Opacity:</b> Can you see light through the material? Y or N				
<b>Room Temperature Flexibility</b> Rating Scale 1 = cracks 2 = stiff 3 = somewhat flexible 4 = very flexible				
<b>Cold Flexibility</b> Rating Scale 1 = cracks 2 = stiff 3 = somewhat flexible 4 = very flexible				
<b>Freezer Flexibility</b> Rating Scale 1 = cracks 2 = stiff 3 = somewhat flexible 4 = very flexible				
<b>Heat Flexibility:</b> To simulate summer conditions, heat samples up to 120° F under a lamp or in an oven. Rate for flexibility.				
<b>Stain Resistance:</b> Place a drop of coffee or mustard on the plastic. Does it stain when you try to wipe it off? Y or N				
<b>Tensile Strength:</b> Use the Dual Range Force Sensor to record how many Newton's (N) it takes before sample breaks.				