Making Bioplastics

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Introduction
What is bioplastic?

• Bioplastics are plastics derived from renewable biomass sources (e.g. plant material)
  • Bioplastics are made up of biopolymers (e.g. starch, cellulose, etc.)
Pros and Cons of Bioplastics

Pros:
• Derived from renewable sources, unlike conventional plastics which are derived from petrochemical sources
• Often biodegrade more quickly
• Do not leach out toxic chemicals

Cons:
• Derived from food stock
• Mixing bioplastics with regular plastic may contaminate the recycling process
• Lower quality plastics?
Conventional plastics: Polyethylene plastic
Conventional plastics: Polystyrene (styrofoam)
Making Bioplastics
Making thermoplastic starch

Directions:
1. Add 15 grams (1.5 tbsp.) starch to beaker
2. Add 100 mL water to beaker
3. Add 10 mL glycerin to beaker
4. Put beaker on hot plate and heat to medium-hot temperatures (~100 degrees Celsius)
5. Stir until solution becomes thick and transparent
6. Pour solution onto aluminum foil or onto a metal pan
7. Let dry for a couple of days
Making thermoplastic starch: How it works?

• Starch is a polymer (long chain) of glucose molecules.
  • Two forms: amylose (unbranched & helical) and amylopectin (branched).

• Amylose & amylopectin aggregate into compact units called granules.

• Heat breaks the intermolecular bonds of starch molecules, exposing sites that hydrogen bond with water, which dissolves the starch granules. Starch then assumes a more fluid (gelatin) form.

• Glycerol (aka glycerin) acts as a plasticizer by interspersing itself between starch polymers, therefore increasing the end product's flexibility.
Starch is a polymer of glucose subunits
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