

Heat-Shrinking Polymers

Objective: The goal of this activity is for students to understand how temperature (heat) can affect the shape and viscosity of polymer materials. The critical parameter here is the glass transition temperature of a polymer (glass → melt and vice-versa) – this can be thought of in the same way as a “melting point” for liquid/solid pairs. Plastics can be categorized as thermoplastics or thermosets, the difference being whether a plastic reversibly or irreversibly changes form when heated/cooled.

Examples of thermoplastics: PP (5), PS (6), PVC (3), Teflon

Examples of thermosets: epoxies (glue), vulcanized rubber (tires)

Materials:

Heat-shrink tubing (for demonstration) ~ \$2

PS plastic (from salad containers, etc.) = free

Sand paper (medium-grit) ~ \$5-20

Baking sheet = free (provided by someone)

Margarine or shortening ~ \$3

Sharpies ~ free

Scissors

Heating element (oven? hot plate? heat gun? lighter?)

Procedure: Start with an introductory demonstration of a heat-shrinking polymer – e.g. a heat-shrink tube over a bundle of wires. This is used in electrical wires. The actual activity will be preparing shrinky dinks.

1. Clean the PS plastic containers and cut out flat sections.
 2. Use sand paper to roughen one side of the sheets
 3. Draw designs on the roughened sides
 - a. Hearts
 - b. Stars
 - c. Flowers
 - d. Rockets
- ... etc.
4. Grease baking sheet with margarine or shortening.
 5. Cut out the shapes with scissors and place them on the baking sheet.
 6. Heat the plastics for ~ 1 min using the heating element.

Students can keep the shrinky dinks!

References:

<http://pslc.ws/macrog/kidsmac/shrinkps.htm>

<http://www.pkwy.k12.mo.us/homepage/kscheff/file/shrinkydink.pdf>