

Honey, I Shrank the Charm!

When it Heats, it Shrinks



Materials Needed

- Clean polystyrene (#6) plastic (Examples: thin foam or clear food trays, thin-walled drinking cups, CD/DVD jewel cases)
- Scissors
- Permanent markers
- Aluminum foil or parchment paper (suitable for baking)
- Baking sheet
- Oven mitt or glove
- Oven
- String or ribbon
- Ruler
- Metal spoon

Grade Range

K-2
3-5
6-8

Topics/Skills

Measurement; Mass;
Reactions; Reuse

Learning Standards

NGSS: [Earth and Human Activity](#); [Matter and Its Interactions](#)
CA Visual Arts: [Creating](#)

Duration

30 – 45 minutes

Prep Time

10 – 15 minutes

Students, with **adult supervision**, will make original jewelry or ornaments by shrinking a piece of #6 plastic (polystyrene) to about 1/3 of its original size by using heat. Shrink art is a great gift idea and makes nice decorations for backpacks and cool jewelry accessories for everyone.

Activity Challenge

Design and make your own ornament or jewelry by using heat to recycle polystyrene (#6) plastic.

Preparation

Note: Adult supervision is required during cutting and baking.

1. Review the Materials Needed list and gather materials.
2. Find a suitable work area, with access to an oven, and with **adequate outside ventilation** (like an open window).

To Do

1. Preheat oven to 350 degrees (Fahrenheit).
2. Line a metal baking sheet with a piece of foil or parchment paper.
3. Cut about a 5-inch square piece from the polystyrene plastic that you found. Use the leftover scraps for another project or put in recycle bin.
4. Draw a picture on the plastic piece using permanent markers. Measure and note the size of the picture. Make sure to fill in the drawing so that the colors will show up well after the piece shrinks.
5. Carefully, cut out your picture. Using the tip of the scissors, poke a ¼ inch hole where you will insert the ribbon or string after baking.
6. Place the finished piece on the baking sheet. Place the baking sheet in the heated oven for 2-3 minutes. If possible, observe what happens to the plastic while it is in the oven. **Warning:** The plastic might release fumes if overheated. **Use adequate ventilation.**
7. Use an insulated cloth (like a glove, mitt, towel), to take the baking sheet out from the oven, since the sheet and the plastic will be hot.
8. If the plastic has curled, flatten it with the metal spoon while still hot.
9. Let the plastic cool for about 5 minutes.
10. Measure and note the size of your picture again. Compare with the size before baking.
11. Put a string or ribbon through the hole and tie a knot.

Observations

- Measure the area of your picture before and after baking. Express the amount of shrinkage as a ratio of 2 numbers:
 - $\frac{\text{Area After Baking}}{\text{Area Before Baking}}$
- Did the hot plastic curl while being heated?
- Was any visible smoke produced while heating?

Extensions

- Find various other polystyrene objects to use to make more shrink art.
 - Do some objects curl, and others retain their shape when heated?
 - If yes, explain.
- Sort through the plastic materials in your house. Organize them based on their recycle number.
- Research polystyrene. What are some of its properties? Describe several ways that scientists and engineers can use this material to solve real-world problems.

The Science behind the Activity

Polystyrene plastic is a polymer made from petroleum. A polymer is a chain of groups of molecules with a repetitive structure. This plastic, marked with recycle number 6, can be commercially recycled, but it is still complex and expensive to recycle it. Industry and environmental groups are still working on easier and more efficient ways to recycle #6 plastic.

This plastic is useful for many applications, including food containers, building insulation and ornamentation, and parts for automobiles, furniture, and appliances. The molecular chains that make up this polymer start out in a tangled form. In the original manufacturing process, heat is used to fashion the plastic into useful objects. The heat-formed objects are then cooled, solidifying the plastic into a fixed shape. Reheating an object to partially melt the plastic allows the molecules to move around again. As the molecules move, the plastic starts to melt and begins to return to its initial, tangled shape. In this activity, the plastic was not given enough heat and time to melt completely. When the object is removed from the heat before it fully melts, its general shape is retained, only in a more compact, miniature form.

Reuse and recycling are similar processes. Recycling involves processing a material using heat, chemicals and/or mechanical means to turn the original object into a new material to make another product. The new product might be similar to the original product, or might be quite different. Recycling materials can save resources and energy that would otherwise be used in making an object from raw materials. But making recycled products also requires some resources and energy.

Reuse is the process of taking a material in its current form and using it for the same or different purpose without changing its form. The practice of reuse reduces solid waste, conserves even more nonrenewable resources than recycling, and may avoid emissions that would otherwise be released during the manufacturing processes using new materials.