

Polyspheres

Introduction

Almost everyone knows what Silly Putty® is, but have you ever made a Silly Putty-type material? Polysphere is easy to make, nonhazardous with normal use, and fun to play with! Brighten up a gloomy day and put a smile on your students' faces by doing a science activity with colorful polymer spheres.

Concepts

- Polymers
- Putty

Materials

Elmer's Glue-All®, white glue, 25 mL	Food coloring, 1–5 drops
Sodium borate solution, 4%, 5 mL (4 g of sodium borate, $\text{Na}_2\text{B}_4\text{O}_7$, or borax dissolved in water to make 100 mL of solution)	Zipper-lock bag, quart size
Water, 20 mL (tap water is fine)	Graduated cylinder, 50-mL
	Tub Tints™ (optional)

Safety Precautions

Although these substances are not considered hazardous with normal use, students should wash their hands thoroughly after handling. Students should be warned not to ingest the materials and use them only in the manner for which they are intended. Do not get glue, Tub Tints, or food coloring on clothing. Students should wear gloves to avoid staining their hands. Follow all normal laboratory safety guidelines.

Procedure

1. Pour a walnut-size amount of Elmer's Glue into a zipper-lock bag. This should be about 25 mL. (Using a graduated cylinder to measure out the glue is not recommended due to the cleanup involved.)
2. Using a graduated cylinder, measure out 20 mL of water and add it to the bag of glue. Add 1–5 drops of food coloring, if desired. Knead the bag well to mix the glue, food coloring, and water.
3. Using a graduated cylinder, measure out 5 mL of sodium borate solution; add it to the glue mixture and knead well.
4. Remove the solid material from the bag and knead it in your hand. (The solid may be sticky for the first couple of minutes.)
5. Answer the following questions regarding the physical properties of the polysphere material.
 - a. Does it stretch?
 - b. What happens when it is pulled hard?
 - c. Roll a piece into a ball and drop it on a hard surface. Does it bounce?
 - d. Roll a piece into a ball and let it sit on a flat surface undisturbed. What do you observe?
6. For additional fun, take two different colored spheres and place one on top of the other and observe. Can you completely separate the two spheres?
7. Store the polysphere material in a closed zipper-lock bag.
8. Wash hands thoroughly when finished.

Disposal

Any liquid left in the zipper-lock bag can be flushed down the drain according to Flinn Suggested Disposal Method #26b. Glassware should be cleaned with soap and water. The zipper-lock bag and polysphere material can be placed in the trash according to Flinn Suggested Disposal Method #26a.

Tips

- Tub Tints™ work well as an alternative to food coloring. The color is more vibrant than food coloring. Simply add one Tub Tint tablet to 500 mL of sodium borate solution and make sure it dissolves before adding it to the glue in the zipper-lock bag.
- Try to combine Tub Tint colors by using 10 mL each of two different color solutions.
- This same procedure can be performed in a paper cup, instead of a zipper-lock bag, and stirred with a stirring rod or craft stick.
- The zipper-lock bags used to make the polyspheres can be rinsed and used for storage.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Constancy, change, and measurement

Content Standards: Grades 5–8

Content Standard B: Physical Science, properties and changes of properties in matter

Content Standards: Grades 9–12

Content Standard B: Physical Science, structure and properties of matter

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Materials for the *Preparation of Polyspheres* are available from Flinn Scientific, Inc.

Catalog No.	Description
S0363	Sodium Borate Solution, 4%, 500 mL
S0364	Sodium Borate Solution, 4%, 1 L
AP5461	Tub Tints™
V0003	Food Coloring, Vegetable Dyes, Set

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.