



Drexel-SDP GK-12 ACTIVITY

Activity: More Silly Polymers

Subject Area(s) Chemistry
Associated Unit Polymers, module 1
Associated Lesson none
Activity Title More Silly Polymers
Grade Level 6 (3-8)
Activity Dependency None
Time Required 30 minutes
Group Size 2
Expendable Cost per Group approx. \$2

Summary

Students will observe different material properties and be able to assess their benefits. Students will understand that polymers can be more complex than a simple string of monomers by making their own “silly polymer” (silly putty).

This module will introduce the students to the world of polymers. Students will learn what a polymer is, how they are made, and how they are used. Students will learn how important polymers are in their everyday lives. Students will also investigate polymers’ connection to renewable and nonrenewable resources, landfills, and recycling through various inquiry based lessons and activities.

Engineering Connection

Chemical engineering is the application of science, mathematics and economics to the process of converting raw materials or chemicals into more useful or valuable forms. Chemical engineers

work to produce the household items we use and appreciate every day, such as Teflon-coated cookware, plastic cups and brightly-colored candies. Plastics ranging from milk jugs to ladies' handbags to thermal underwear are also designed by chemical engineers – these plastics are often referred to as polymers. In this activity, students will investigate the absorption property of a polymer and will try to guess its identity.

Keywords

Polymer, chemical engineer,

Educational Standards

- Science:4.2.7 Renewable and non-renewable resources, A. Know that raw materials come from natural resources, B. Examine the renewability of resources, 3.1.7 Unifying themes, C. Identify patterns as repeated or recurring elements in science and technology., 3.2.7 Inquiry and Design, B. Apply process knowledge to make and interpret observations., 3.4.7 Physical Science, Chemistry, and Physics, A. Describe concepts about the structure and properties of matter
- Math: 2.5-Mathematical Problem Solving and Communication, E. Develop problem solving strategies (drawing a picture or a diagram), 2.6- Statistics and Data Analysis, A. Organize and display data using pictures, tallies, tables, charts, scatter plots, bar and circle graphs, 2.8-Algebra and Functions, B. Discover and describe patterns including linear, nonlinear relationships, D. Represent relationships using pictures, words and tables

Pre-Requisite Knowledge

Be familiar with the practice conducting an experiment in a controlled, measured way.

Learning Objectives

After this lesson, students should be able to:

- Explain the properties and definition of a polymer
- Provide some examples of polymers around their house

Materials List

1 plastic spoon per person
1 plastic knife per person
1 cup per person
1 ziploc bag per person
1 measuring cup per group
water
glue
laundry detergent (dry powder)

Introduction / Motivation

QUESTION:

What happens when we mix glue and laundry detergent?

LET'S FIND OUT!

Vocabulary / Definitions

Word	Definition
Cross linked polymer	Cross-links are bonds that link one polymer chain to another.
Branched polymer	Polymer having smaller chains attached to the polymer backbone.
Elasticity	The tendency of a material to return to its original shape after it has been stretched or compressed
Rubber	An elastic material obtained from the latex sap of trees.

Procedure

Background

Nearly all materials that make up living organisms involve polymers. Stages of civilization are characterized by the building materials used. The Stone Age was first, followed by the Bronze, Iron, and Steel Ages. We are now living in the age of polymers. The word polymer might be unfamiliar, but without them life as we know it would not exist.

Before the Activity

Review vocabulary on polymers.

With the Students

PROCEDURE:

1. Read all of the procedure BEFORE doing anything!
2. Collect materials listed in the equipment section except the laundry detergent

Let's use your math knowledge to figure out how much laundry detergent we will need!

# of group members	2	4	6	5
Laundry detergent (spoonfuls)	1			
Water (cups)	$\frac{1}{2}$			

3. Have one member of your group measure out ____ cups of water.
4. Have one member of your group add ____ spoonfuls of laundry detergent (sodium borate) to the water. Mix with the knife until all powder is dissolved.
5. Add 5 spoonfuls of glue to your own cup
6. Add 5 spoonfuls of water to your own cup
7. Mix with plastic knife the water and glue.
8. Add $\frac{1}{4}$ cup of the water/laundry detergent solution to your cup. MIX.
9. Add solution to Ziploc bag (CAREFULLY...do not spill it!) Keep mixing the bag. Once its mixed, you can take it out and roll it into a ball.

Safety Issues

DO NOT EAT ANYTHING

Keep out of EYES

NO THROWING of anything

Keep water/glue/laundry detergent in the cup or bag... not on floors or tables

READ THE DIRECTIONS

Investigating Questions

Copy the following into a worksheet:

EXPERIMENTAL RESULTS:

Explain how the physical properties of the glue/water mixture changed with the addition of laundry detergent?

Observation of what happens when you pull the polymer slowly:

Observation of what happens when you pull the silly putty quickly:

Using a ruler, drop the ball of polymer from 30cm. How high does it bounce?
_____cm

What is the ratio of the height of the drop to the rebound height?

What do you think would happen if you were to add more laundry detergent?

What if you added less?

Assessment

Pre-Activity Assessment

None

Activity Embedded Assessment

Each student completes worksheet of questions during class.

Post-Activity Assessment

Assign a writing activity based upon this lesson.

Activity Extensions

Suggested Reading:

Polymers All Around You!- Linda Woodyard

Owner

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Contributors

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