



*Drexel-SDP GK-12 ACTIVITY*

**Subject Area(s):** Chemistry

**Associated Unit:** None

**Associated Lesson:** None

**Activity Title:** Disappearing Styrofoam and Cornstarch

**Grade Level:** 5 and 8

**Activity Dependency:** None

**Time Required:** 90 minutes

**Group Size:** 1 student

**Expendable Cost per Group:** US \$3

**Summary**

Student will take Styrofoam and biodegradable cornstarch peanuts and chemically defoam them using the solvents acetone and water.

**Engineering Connection**

Engineering foams are used in many applications from surfboards to airplane wings. Understanding how polymers are foamed is just as important as how they can be unfoamed, as solvents like water and acetone can be prevalent on a production floor and it's important to understand what can happen if you expose a foamed polymer to a solvent that defoams it!

**Keywords** polymer, solvent, foam

**Educational Standards**

- Science: 3.4.7
- Math: None

## Learning Objectives

After this lesson, students should be able to:

- Explain what a foamed polymer is
- Explain what a solvent is
- Explain the difference between the synthetic and natural foamed polymer

## Materials List

Each group needs:

- Acetone (available at hardware stores)
- Warm Water
- Styrofoam peanuts (available at Staples)
- Biodegradable peanuts (available at UPS)
- 4 plastic cups (make sure they aren't dissolved by acetone)
- 2 plastic spoons

## Introduction / Motivation

Packing peanuts are used for packing material, they come in two types Styrofoam and cornstarch (a biodegradable natural polymer). Packing peanuts are full of gas pockets; these make the polymers lightweight and give them the ability to easily absorb impact. These gas pockets can be removed mechanically by smashing them and flattening the foamed polymer. The gas pockets can also be chemically removed by defoaming the polymer with the proper solvent for that material. The solvent for Styrofoam is acetone and the solvent for the biodegradable cornstarch peanuts is water. The solvents work by creeping between the solid polymer networks and causing the polymers to soften; this causes the peanuts to collapse as the trapped gas escapes. Only a small amount of solvent is needed to defoam a large amount of foamed polymer!

## Vocabulary / Definitions

Word	Definition
Polymer	A chemical compound made up of a large number of identical components linked together like a chain. This substance is often referred to as a plastic.
Solvent	A liquid, solid, or gas that dissolves another solid or liquid resulting in a solution.

## Procedure

### Background

The solvent for Styrofoam is acetone, the solvent for the cornstarch peanuts is water.

### **Before the Activity**

- Fill 1 cup each for each student with Styrofoam and cornstarch peanuts and label them
- Label an additional cup for each student water
- Label an addition cup for each student acetone

### **With the Students**

1. Give the students the cups of peanuts and the labeled water and acetone cups
2. Give the students a small amount of water, warm water works faster but any temperature water will work.
3. Have the students add a small amount of water to their **cornstarch peanuts**.
4. Middle school students enjoy making “goo”, so if they add too much water they will just have a cup of water, they can add more peanuts until they get a “goo”.
5. Repeat this process with acetone and the Styrofoam peanuts.
6. The “goo” can be dried; observations and conclusions can be drawn from this defoamed polymer.

### **Safety Issues**

- Do not let the student ingest the acetone or put it in their eyes, read the safety information on the acetone container for additional information.

### **Troubleshooting Tips**

There are no common issues with this activity.

### **Investigating Questions**

- How can you get the gas out of a foamed material?
- Why does water work on the cornstarch peanuts and not the Styrofoam, and vice versa?

### **Assessment**

#### **Pre-Activity Assessment**

*Class Discussion:*

- What are packing peanuts?
- Why do we use them?
- Why do they work better than just using other polymers?
- How can you get the gas out of the foamed material?

#### **Activity Embedded Assessment**

*Class Discussion:*

- Have the students explain what is happening as they are adding peanuts to their water and acetone.
- What are the difference between the dried defoamed polymer and the foamed peanuts? What conclusions can be drawn from this?

**References**

Polymers All Around You!- Linda Woodyard

**Owner**

Drexel University GK-12 Program

**Contributors**

Valerie R. Binetti, MSE Department, Drexel University

**Copyright**

Copyright 2008 Drexel University GK-12 Program. Reproduction permission is granted for non-profit educational use