

# Polymers— Experiment Summaries and Concepts



## *Let's Make Slime!—Properties of Polymers*

Polymers are interesting and useful modern materials. There is one polymer that really stands out, that has inspired more people, young and old, to learn about polymers. That polymer is . . . slime! Slime is an excellent example of a polymer with unusual properties. It is a solid, it is a liquid, it is both! Don't be fooled, this fun lab is a great introduction to the basic structure and function of polymers.

## *Structures and Properties of Polymers—Activity Stations Lab*

From a natural polymer extracted from seaweed to a synthetic polymer that's in the *Guinness Book of World Records*, polymers have unique properties. The purpose of this experiment is to investigate the properties of polymers and to relate the properties of polymers to their structures. Set up four “activity stations” around the lab, with a different polymer at each station, and let students discover the working principles of polymer structure.

## *Properties of a Natural Polymer—Stress versus Strain*

The mechanical properties of natural rubber can be explained in terms of the size and flexibility of polymer molecules and how they are bound together. The purpose of this experiment is to investigate the elastic properties of natural rubber by measuring how the length of a rubber band changes as weights are added. Students calculate the resulting stress and strain on the rubber band and analyze the results by graphing the data.

## *Sorting Plastics by Density—Recycling and Everyday Use*

Recycling plastics is a special challenge because of the amount and variety of plastics in everyday use. The purpose of this experiment is to investigate the composition and properties of plastics and their recycling codes. Students determine the densities of unknown plastics using a “sink-or-swim” method in liquids having different densities. Identifying the unknowns helps students appreciate how discarded plastics must be sorted and separated.

## *Small-Scale Synthesis of Polymers—Polystyrene and a Polyester*

The list of polymers that we use every day is so long, and polymer products are so pervasive, that it is difficult to identify items that do not contain polymers. All polymers, however, are basically made by one of two methods, by either addition or condensation reactions. Compare and contrast these methods of preparing polymers by making polystyrene and a polyester on a small scale. The procedures have been “downsized” and simplified to make them suitable for high school chemistry.

## *Designer Gluep—How to Make a Glue Ball Bounce*

Adding sodium borate to glue produces “Gluep,” a gel-like substance that resembles Silly Putty®. The goal of this guided-inquiry activity is to use the scientific method and the principles of experimental design to make a Gluep ball that will be easy to work with, keep its shape, and bounce the highest. Discover the concepts at work (and in play) in cross-linked polymer gels!



## Concepts

- Polymers
- Cross-linking
- Hydrogen bonding
- Hydrophilic gel
  
- Natural and synthetic polymers
- Hydrophilic polymer gels
- Amorphous vs. crystalline solids
  
- Polymers
- Natural rubber
- Elastomers
- Stress and strain
  
- Plastics and polymers
- Recycling code
- Physical properties
- Density
  
- Polymerization
- Addition polymers
- Condensation polymers
- Catalysts
  
- Polymers
- Cross-linking
- Polymer gel
- Scientific method