

Name: _____

Blk: _____ Date: _____

Chemistry 11
Organic Chemistry Lab: The Polymerization Process and Silly Putty

Objectives:

1. To experience the hands-on process of crossing over
2. To write out the complex reaction that occurs when making silly putty

Background information:

When the glue mixture and borax solution are combined, a change occurs. By adding the borax solution to the glue mixture, you start a chemical reaction. The glue molecules and the borax molecules react with each other to create a stretchy, bouncy new substance.

Borax is: Sodium tetraborate octahydrate or $\text{Na}_2\text{B}_4\text{O}_5(\text{OH})_4 \cdot 8(\text{H}_2\text{O})$.

White glue is a mixture of **water** and **polyvinyl acetate**:

Water is: H_2O .

Polyvinyl acetate is: $(\text{C}_4\text{H}_6\text{O}_2)_n$. *The n stands for any number of molecules.*

The white glue's polyvinyl acetates react with water to some extent to replace some of the acetate groups with OH (alcohol) groups. The B-OH groups on the borax molecules react with the acetate groups on the glue molecules (relatively long polymer chains) to eliminate acetic acid and form new bonds between the borax and two glue molecules. The linking of two glue molecules via one borax molecule is called **polymer cross-linking** and it makes a bigger polymer molecule, which is now less liquid-like and more solid

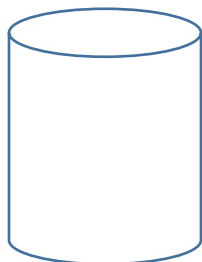
Procedure:

1. Put one teaspoon of water into a 100 mL beaker, then add one teaspoon of white glue and mix well with stirring rod.
 2. In another 100 mL beaker, create your borax solution by mixing one teaspoon of borax with four teaspoons of water. Stir well. The solution will be saturated, so all of the borax will not dissolve.
 3. Add one teaspoon of the borax solution to your beaker with glue and water. Stir for 60 seconds.
 4. Remove the substance and knead it with your hands for one to two minutes.
- (During this experiment, you will be measuring and mixing substances. If the measurements are not exact, the experiment will not work correctly. If silly putty doesn't form you might try adding more borax, adding more glue, or just starting over.)

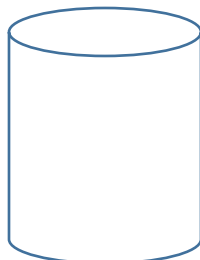
Data and Observations:

In the beakers below draw each mixture:

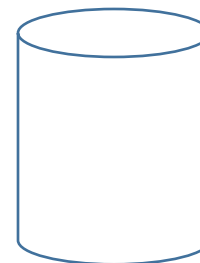
Glue Solution:



Borax Solution:



Silly Putty:



Analysis:

There is no analysis as this is not a quantitative lab

Discussion:

1. Define the following key terms:
 - a. Molecule:
 - b. Monomer:
 - c. Polymer:

2. List some substances that are polymers or are made of polymers:

Sources of Error:

There are no sources of error as this is not a quantitative lab

Conclusion:

Go online and find an example of cross-linking to make the silly putty polymer: