

Polymer Research Activity

OVERVIEW

This activity should be preceded by an introduction to atoms and molecules. You will explore the physical change of two different polymer materials, an organic (GLUE) and an inorganic (Borax). White Elmer's Glue-All is an organic (*molecule whose central atom is Carbon*), vinyl -based (*two carbons in monomer*) polymer (*a long chain molecule*). A polymer is made up of repeating monomer units, in this case the vinyl group. Borax is an inorganic compound (sodium tetraborate) containing sodium, boron, and oxygen atoms and capable of forming extended chains as a polymer especially when dissolved in water. Borax is mined as a dry powder and can be used as a cleaning detergent and as a water softener. When the Borax and the glue solutions are combined, the result of their interaction is the formation of a material that has totally different properties from either of the individual components.

OBJECTIVE

- To formulate a *Polymer* by participating in a Research team. Each team will create criteria describing the desired end product for their team.
- To learn the importance of using a scientific technique (practice of using extreme care).
- To apply the *scientific method*

Purpose - what do you want to know? Hypothesis - what do you predict will happen? Procedure - conduct research to test your ideas, Results - collect and record what happened; Conclusion - what did you learn from the project?)

MATERIALS

- Elmer's Glue-All solution (*Measure equal amounts of Elmer's Glue-All and water.*)
- BORAX solution (*1/4 cup of BORAX dissolved in one quart of hot water.*)
- Plastic sample bags (*Zip-Lock bags*) 3/team
- Measuring Cups (*30 ml medicine cups*) 2/team

- Labels (*stick-on labels for sample bag identification.*) 3/team
- Pencils 1/team
- Plastic gloves (*optional*)
- Food coloring (*optional*)

PROCEDURE

1. Determine and record the desired properties of the new polymer.
2. Determine and record the amount of Glue Mixture and Borax Mixture you will have in each sample (3 samples). Use units of 5. Each sample is limited to 40 ml (40 cc). Record the resulting ratio.
3. Add 5 to 6 drops of food coloring to each sample bag.

Research Activity Chart

Desired properties of the new polymer:

Sample	Ratio	Amount of <u>Glue</u> Mixture	Amount of <u>Borax</u> Solution	Result	Color

4. Add the amount of glue to each sample and mix in the food coloring.
5. Add the amount of Borax to each sample.
6. Mix each sample for at least 5 minutes.
7. Record the results of each sample.
8. Study your results to determine which ratio produced a polymer resembling your desired results and circle that ratio.

9. Modify one of your samples to get as close as possible to your desired properties of the new polymer. Record your results as the fourth sample.

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