

Bouncy Ball

Overview: This is one of those “chemistry magic show” types of experiments to wow your friends and family. Here’s the scoop: You take a cup of clear liquid, add it to another cup of clear liquid, stir for ten seconds, and you’ll see a color change, a state change from liquid to solid, and you can pull a rubber-like bouncy ball right out of the cup.

What to Learn: Solids and liquids have different properties. Polymers are long chains that can be linked together to form silicones which have really cool uses.

Materials

- sodium silicate (“water glass”)
- ethyl alcohol, also called ethanol (70%)
- beakers or disposable cups (2 per group)
- popsicle sticks (2 per group)
- teaspoon measures (2 per group)
- rubber gloves
- small Ziploc bags

Experiment

1. Wear your gloves and put your goggles on. No exceptions!
2. In one cup, measure four teaspoons of sodium silicate solution (it should be a liquid). Sodium silicate can be irritating to the skin for some people, so wear rubber gloves when doing this experiment!
3. Measure 1 teaspoon of ethyl alcohol into a second cup. Ethyl alcohol is extremely flammable—cap it and keep out of reach when not in use.
4. Pour the alcohol into the sodium silicate solution and stir with a popsicle stick.
5. You’ll see a color change (clear to milky-white) and a state change (liquid to a solid clump).
6. Using gloves, gather up the polymer ball and firmly squeeze it in your hands.
7. Compress it into the shape you want—is it a sphere, cube, or do you prefer a dodecahedron?
8. Bounce it!
9. Be patient when squeezing the compound together. If it breaks apart and crumbles, gather up the pieces and firmly press together.
10. When finished, seal ball in plastic bag. It will eventually become a bouncy pancake which may be reformed by slowly squeezing the pieces together.
11. Fill out the Bouncy Ball Data Table

Bouncy Ball Data Table

Compound/Object	Detailed Description
Sodium silicate	
Ethyl alcohol	
Bouncy ball	

Reading

Polymers are made up of many molecules all strung together to form really long chains. The sodium silicate is a long polymer chain of alternating silicon and oxygen atoms. When ethanol (ethyl alcohol) is added, it bridges and connects the polymer chains together by cross-linking them.

Think of a rope ladder—the wooden rungs are the cross-linking agents (the ethanol) and the two ropes are the polymer chains (sodium silicate).

Silicones are water repellent, so you'll find that food dye doesn't color your bouncy ball. You'll find silicone in greases, oils, hydraulic fluids, and electrical insulators.

A solid is a kind of matter that has its own shape and does not flow at a given temperature. The molecules that make up a solid are close together and have little movement. Solids can be different colors and textures and have different degrees of malleability. Liquids take the shape of their containers. The molecules in a liquid are further apart and are able to vibrate and move more freely.

Exercises

1. Before the reaction, what was the sodium silicate like? Was it a solid, liquid, or gas? What color was it? Was it slippery, grainy, viscous, etc.?
1. What was the ethanol like before the reaction?
2. How is the product (the bouncy ball) different from the two chemicals in the beginning?
3. Is the bouncy ball a solid or a liquid? How do you know?
4. Was this reaction a physical or chemical change?

Answers to Exercises

1. Before the reaction, what was the sodium silicate like? Was it a solid, liquid, or gas? What color was it? Was it slippery, grainy, viscous, etc.? (clear liquid, slippery, viscous)
2. What was the ethanol like before the reaction? (clear liquid, runny)
3. How is the product (the bouncy ball) different from the two chemicals in the beginning? (it forms a temporary ball which bounces, and is white in color)
4. Is the bouncy ball a solid or a liquid? How do you know? (It acts like a solid but is really a liquid because it takes the shape of its container).
5. Was this reaction a physical or chemical change? (chemical change)