

Corny Polymer Balls



Corny Polymer Ball STEM Pathways Challenge!

By Patty House, 4-H Youth Development Educator, Clark County (OSU Extension).

Background:

Balls have been a favorite toy forever. The first bouncy ball was invented by a California Chemist, Norman Stingley in 1965. He spent his spare time experimenting with scraps of synthetic rubber. Today bouncing balls are made of plastics and other polymers too.

Like Stingley, you are going to use chemistry to make your own bouncing ball. Instead of rubber, you will use common household items to create your ball.

Polymers are many molecules strung together to form long chains. Things made of polymers look, feel and act depending on how the atoms and molecules are connected. Some may be rubbery, while others may be sticky, gooey or even hard or tough. So, how will the ball you make react when you throw it against the floor, table or wall? Will it bounce off or just go flat?

Materials and Supplies Needed:

- ◆ Glue (white, clear, all-purpose, school, wood, washable, different brands).
- ◆ Borax* (laundry-booster)
- ◆ Cornstarch
- ◆ Water
- ◆ Food coloring
- ◆ Measuring spoons (tablespoon, ½ teaspoon)
- ◆ Small disposable cups
- ◆ Plastic spoons or craft sticks to stir
- ◆ Plastic table covering to make clean up easy
- ◆ Paper towels
- ◆ Handy Wipes* or soap and water for washing hands



Important Safety Alert:

Polymers can swell up five times their size. When handling chemicals even those that are non-toxic, safety comes first! Remind youth you are working with the following: “DO NOT EAT THE BALL or the ingredients used to make the ball! Wash hands with soap and water after handling the ingredients and/or the ball!”

Directions:

Step 1: Make Borax* solution in Cup A. - will make multiple balls.

- Place 2 tablespoons of warm water into Cup A.
- Add ½ teaspoon of Borax* powder and stir until Borax dissolves.
- Add a drop of food coloring.

Step 2: Make ball mixture in Cup B

- Place 1 tablespoon of glue into Cup B.
- Add a ½ teaspoon of the liquid borax solution you made in Cup A on top of the glue.
- Add 1 tablespoon of cornstarch.
- DO NOT STIR YET!
- Count to 20 slowly to allow ingredients to interact with each other. Then STIR with the spoon or craft stick!

Chemistry note to volunteer facilitating: *Not all the glues listed under materials and supplies work. Discovering what works and what doesn't is part of the fun learning process. Clear school glue seems to make the bounciest ball. Discover with your Cloverbuds what works and what doesn't!*

Step 3: Mixing together

- Stir materials together in Cup B until the mixture is impossible to stir.
- Take mixture out of Cup B and start molding the ball with your hands.
- Ball will be sticky and messy at first, but kneading will form it into a solid.

Chemistry note to volunteer facilitating: *Glue contains the polymer polyvinyl acetate (PVA) which cross-links to itself when reacted with Borax*.*

Step 4: Test it and make observations:

- Bounce your ball on the table or floor.
- How bouncy is it?
- What would you like to change?
- Who had the bounciest ball? Why do you think one ball may be bouncier than another even if the same ingredients were used?
- What ingredient do you think you need to change to improve your results?
- Make another ball and compare to the first one you made.

Chemistry note to volunteer facilitating:

- Add more glue to make slimier.
- Add less borax to make goopier.
- Add more corn starch to make more stretchy or bendable.

Step 5: Store ball with safety reminder in a zipper type bag.

- Remind the youth: Do not eat the ball or the ingredients used to make the ball. Wash your hands with soap and water!

Further application: *What do you think would happen if....*

- You left an ingredient out;
- You used more or less of one ingredient;
- You used cold water;
- You did not stir.

For more STEM Pathways information visit: <http://www.ohio4h.org/STEM-Pathways>

* "No endorsement is intended for specific products nor is criticism meant for products not mentioned."

OHIO STATE UNIVERSITY EXTENSION	
Stem Pathways Safety Alert	
The Corny Polymer Ball You Made Contains Glue and Borax* (a laundry booster).	
DO NOT EAT THE BALL!	
Wash Your Hands After Handling!	
	THE OHIO STATE UNIVERSITY COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES
	

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