

# Polymer Slime

Grade Level: 3, 4, 5, 6

Duration: 40-60 minutes

Classification: Classroom, STEM Spark

Subject(s): Chemistry, Materials Engineering

Categories (STEM): Science

Keywords: Slime, Polymer, Chemistry, Science

## **Introduction**

- Summary - Students will learn about polymers while creating slime.
- Description - They will get to create their own polymer slime to study and observe that polymers can have both liquid and solid properties.

## **Vocabulary**

- Polymer - big molecules made up of many smaller molecules layered together in a repeating, means “many parts”
  - Natural examples of polymers: silk, wood, DNA strands, proteins
  - Man-made examples of polymers: plastic, rubber, nylon, polyester, slime

## **Materials**

<b>Materials</b>	<b>Quantity</b>	<b>Reusable?</b>
White Glue	¼ cup per Student	No
Baking Powder	1 tsp per Student	No
Saline Solution	2-3 Tbsp per student	No
Food Coloring	2 Drops per Student	No
Glitter (optional)	2-3 jars per Classroom	No
Ziploc Bags	1 per Student	No
Plastic Spoons	1 per Student	No
Paper Towels	1 Roll per Classroom	No
Measuring Cups	1 per Classroom	Yes
Measuring Spoons	1 per Classroom	Yes

## Directions

- Begin the lesson with an explanation of polymers. A polymer is a type of molecule that is made up of little subunits linked together in long strands.
- Have each student measure out 1/4 cup of white glue and 2-3 drops of food coloring into their sandwich baggie and mix until it's all combined. Make sure they seal their zip lock baggie tight so as to avoid spilling.
- Have each student add 1 tsp of baking soda and 2-3 tablespoons of saline solution until completely combined.
- Once it is combined, they can start kneading. This takes around 5 minutes. More glue or saline solution might need to be added.
- Optional: add glitter to the slime for extra fun! Help the students use the glitter to avoid a mess. Beads might also be provided if the slime is made with clear glue.
- When they are all done have them put their slime into a Ziploc bag.
- Explain the chemistry of how we made the slime. Chemical bonds are formed when you mix the glue and slime activators (baking soda and saline solution) together. Slime activators change the position of the molecules in the glue in a process called cross-linking!

## Discussion Questions

- Is slime a liquid or a solid?
  - It is a non-Newtonian fluid. That means that it is neither a liquid nor a solid. It can be picked up like a solid, but it also will ooze like a liquid. Slime does not have its own shape.
- What happens if you pull the slime apart slowly? What if you pull the slime apart quickly?
  - When you pull the slime apart quickly, it breaks apart easier. This is because you are breaking the chemical bonds when you pull fast. When you pull slowly, the slime has time to form new chemical bonds as it stretches.
- What makes slime stretchy?
  - The glue used in slime is made up of long chains of polyvinyl acetate molecules. These chains slide past one another fairly easily which the glue keeps flowing. When combined with baking soda and saline, the long chains become cross-linked. Instead of flowing freely as before, the molecules in the slime have become tangled and create slime.

## **What is happening?**

- The slime the students made is a polymer.
- White glue is one type of polymer and when mixed with the baking soda and the saline solution, the glue formed long chains of thousands of little molecules that you couldn't see until you added the other things to the solution.
- The Baking powder and saline reacts to the glue. It links all of the chains together creating a different type of polymer.

## **Applications:**

- Majors - Materials Engineering, Chemistry
- Jobs - Chemist, Materials Engineer
- Hobbies – Slime, Baking
- Real-World applications
  - Polymers are in: soft, flexible plastics, microwavable food containers, tires
  - Animals use slime to stay healthy and protect themselves. Slimy mucous cocoons protect some fish from parasites, and humans produce a fair amount of mucous ourselves in our nasal cavities, traps contaminants and can be an indicator of health, depending on its color.
  - Hagfish slime is so resilient that military researchers are investigating its properties and producing synthetic versions to protect warships, which could function like stickier and slimier versions of the bullet-deflecting Kevlar armor that soldiers wear.



This activity was last updated in fall 2020 by Student Role Models.