



Project Exploration creates transformative learning opportunities for youth underrepresented in the sciences –particularly students of color and girls – by equipping them with the skills, practices, and mindset needed for a lifelong pursuit of learning. STEM@Home makes activities around science, technology, engineering, and math accessible and fun to do at home. This STEMbook activity, resources, and more are available at www.projectexploration.org/stemathome.

In this activity, you will:

create a chemical reaction that produces "plastic"!



Supplies Required:

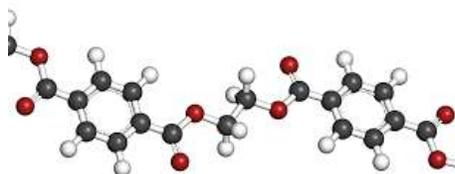
- 1 cup of milk
- 4 tablespoons of white vinegar
- Strainer
- Large bowl
- Cotton cloth or teeshirt
- Cookie cutter
- Food coloring

Video

Learn how to turn milk into "plastic": <https://tinyurl.com/yab8smew>

Overview

Also known as casein plastic, this process has been used for over 100 years and is the way they used to make plastics before 1945 when synthetic plastics were introduced. Even royalty wore jewelry made from milk plastic many years ago. How cool is that? When you mixed vinegar with milk and heated it, the milk curdled or separated into curds (the solids) and whey (the liquid). Curds are the fat and casein (protein) from the milk. They form together in chains known as polymers. A polymer is a long chain of hundreds or thousands of tiny molecules. Polymers are generally very large molecules made up of lots and lots of smaller molecules all linked together. The plastic you made is an interesting type of polymer made up of chains of casein from milk. All plastics are polymers. The casein chains you formed in this experiment will harden into a type of plastic. In the early 1900's, casein plastic like this was used to make many plastic objects including buttons and jewelry.



Instructions

1. You'll need 1 cup of warm milk (stove top or microwave) DO NOT BOIL
2. In a large bowl pour the warm milk add 4 tbsp of white vinegar
3. Stir gently. Clumps (casein) should appear
4. Sit a strainer on top of a bowl
5. Carefully pour your mixture in the strainer
6. Remove your large clump (casein) place on a napkin or an old white t-shirt
7. Drain out the excess water by patting dry
8. Roll your clump (casein) in a ball
9. Place on flat surface, flatten out
10. Use your cookie cutter or mold to create your artwork. Use excess to make it thicker
11. Sit your plastic in a cool dry place to dry for about 2 days
12. To add color: After straining, soak your plastic in vinegar and add in food coloring for about an hour. Drain then remove excess liquid.

Additional Resources

Think About It!

What would happen if you used a different type of milk? Do you think temperature has an effect on the result? Explain your thinking. Do you think this is a better way to make plastic than the current way (from fossil fuels, oil)? Why or why not?

1. Additional directions: <https://tinyurl.com/yxqytpdr>
2. Take a Crash Course on polymers: <https://tinyurl.com/y9c8zwmu>
3. Learn about plastics: <https://tinyurl.com/y8h76f6o>

Share It Out

Share on social media: share what you made with the world! Use the hashtags:

#MilkPlastic
#ProjectExploration
#StemAtHome

Share via PE's website: Students who complete STEM@home activities and share what they learned with the PE team via our website will earn points which can be traded in for cash prizes at the Explore Store. Your project number is 218. Learn more at www.projectexploration.org/explore-store

Join PE's character contest!

Design a STEM character who will lead kids through activities and be featured on our website and in our STEMbooks. Cash prizes will be awarded to the top 3 finalists. Learn more at: www.projectexploration.org/character-contest.



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