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PLASTIC OUT OF MILK

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ABSTRACT

Plastic out of milk is a very interesting and useful concept. In 20th century, different ornaments of plastic were made up of milk. In this experiment we use a component of milk called Casein to make plastic. This plastic can be used to make ornaments, decorative articles, etc.

In this experiment, we find out how to make plastic from milk and the uses of plastic made from milk.

Keywords: Casein, plastic, milk, polymer.

I.INTRODUCTION

But how can milk be changed into plastic? To answer that we need to think first about what plastic is. The word plastic is used to describe a material that can be molded into many shapes. Plastics do not all look or feel the same. Think of a plastic grocery bag, a plastic doll or action figure, a plastic lunch box, and a disposable plastic water bottle. They are all made of plastic, but they look and feel different. Their similarities and differences come from the molecules that they, like everything else, are made of. Molecules are the smallest units (way too small to see with your eye!) of any given thing. Plastics are similar because they are all made up of molecules that are repeated over and over again in a chain. These are called polymers, and all plastics are polymers. Sometimes polymers are chains of just one type of molecule. In other cases polymers are chains of different types of molecules, that link together in a regular pattern. A single repeat of the pattern of molecules in a polymer (even if the polymer uses only one type of molecule) is called a monomer.

Milk contains many molecules of a protein called casein. When you heat milk and add an acid (in our case lemon juice), the casein molecules unfold and reorganize into a long chain. Each casein molecule is a monomer and the polymer you make is made up of many of those casein monomers hooked together in a repeating pattern. The polymer can be scooped up and molded, which is why it is a plastic.

In this chemistry science project, we will investigate what is the best recipe for making casein plastic by making batches of heated milk with different amounts of lemon juice. Without enough lemon juice the casein molecules do not unfold well, making it difficult for them to link together into a polymer. Of course, if you were manufacturing you would be thinking about both the amount of plastic you can make and the cost. The more of any ingredient you use the more expensive the end product is. The "best" recipe will have the highest yield (make the most plastic) for the smallest amount of lemon juice.

II.RESOURCES

Milk, Lemon Juice (citric acid).

III.PROCEDURE

Making Casein Plastic

Using the masking tape and pen, label the four mugs: 1, 2, 4, and 8.

Use the measuring spoon to add 1 teaspoon (tsp.) of lemon juice to the mug labeled "1," 2 tsp, to the mug labeled "2," 4 tsp. to the mug labeled "4," and 8 tsp. to the mug labeled "8."

Heat 4 cups of milk in a large measuring cup in the microwave or on the stove.

The exact amount of time needed will depend on your microwave. Start by warming the milk at 50% power for five minutes. The 50% power will help you avoid scalding (burning) the milk.

Warm the milk upto 49°C (120°F). If it is not heated enough, put it back in the microwave. Repeat this step until the milk is hot. Warmer than 49°C is fine.

Pour 1 cup of hot milk in to each of the four mugs with lemon juice in them. In at least one of the mugs you should see that the milk has separated into white clumps (called curds).

Make sure to pour the milk in to all four of the mugs at the same time so that the milk is the same temperature across all four lemon juice amounts.

Mix each mug of hot milk and lemon juice slowly with a spoon for a few seconds. That will help make sure the lemon juice reacts with as much of the milk as possible.

Meanwhile, take one of the cotton-cloth squares and attach it with a rubber band to the top of one of the clear cups so that it completely covers the cup's opening.

Make sure the cloth hangs down a bit inside the cup so that you have room to pour liquid in.

Repeat this step with the other three clear cups.

Once the milk and lemon juice mixture has cooled a bit, carefully pour the mixture from mug "1" into the cotton cloth sieve on cup "1." If there are any curds, they will collect in the cloth sieve. The leftover liquid will filter into the clear cup.

A piece of cotton cloth and a rubber band are used to make a sieve at the top of a clear glass. Once the milk and lemon juice mixture is poured into the sieve, the curds will gather on the top of the sieve, and the liquid will drain through into the clear cup.

Over a sink, carefully remove the rubber band sieve on cup "1." With your hands, squeeze all the extra liquid out of the curds. Scrape the curds off of the cloth and knead them together, as you would bread dough, into a ball. This is your casein plastic.

The wet casein plastic will form a lumpy ball of whitish dough.Weigh the ball of casein plastic on a kitchen scale (set for grams) using a piece of wax paper to keep the scale clean. Record the weight.

When weighing, remember to turn on the scale and first make sure it reads zero with nothing on it. This will help make sure your measurements are accurate. Also, use a new sheet of wax paper each time you weigh a different ball of casein plastic. This will give you exact weights (without crumbs and liquid from the last ball)

The amount of casein plastic each recipe makes is called the yield for that recipe. The more plastic, as measured by weight in this case, the greater the yield.

Repeat steps 7-10 for the other three mugs of milk and lemon juice.

If you want to make your casein plastic into something, you can color, shape, or mould it now (within an hour of making the plastic dough) and then leave it to dry on some paper towels for at least 48 hours

We can make beads, ornaments, or figurines out of your casein plastic. Moulding and coloring steps should be done (except for paint and/or marker) within the first hour of making the plastic or it will start drying out.

Shaping the plastic:

Knead the dough well before shaping it.

Moulds and cookie cutters work well on the wet casein plastic.

Coloring the plastic:

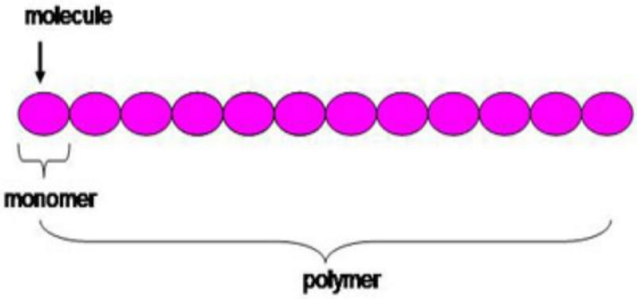
Food coloring, glitter, or other decorative bits can be added to the wet casein plastic dough.

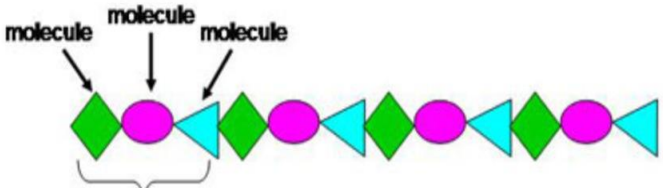
Dried casein plastic can be painted or colored on with markers.

Hardening the plastic:

Casein plastic will be hard once it has dried.

Drying time varies depending on the thickness of the final item (thicker pieces take longer), but most casein plastic requires at least two days to become hard.





IV.CONCLUSION

The experiment is very safe and very economical. The plastic made out of milk is easily decomposable. There is Casein formation after we mix acid with the milk. This Casein gives milk the plastic like qualities. Such plastics can be used as jewellery, decorative items, etc. The demonstration is a very good example of polymerisation. Thus, plastic is made out of milk with help of lemon juice (citric acid).

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