Case in Plastic

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ABSTRACT

Any mammalian milk/paneer containing ample amount of Lactic acid can be transformed into such a bio degradable plastic polymer. Lactic acid in 'mammalian milk'/paneer i.e. cow milk in our case can coagulate casein globules. Casein is nothing but family of phosphoprotein (αS1, αS2, β, κ). Cow's milk contains around 80% of such proteins. These casein globules is used in various products such as glues, paints, protein supplement etc. When these casein globules are treated with certain acids it transformers to a hard plastic polymer.

Such a plastic polymer is bio degradable. It is also non allergic and virtually inflammable. It is cheap to manufacture and have low to medium tensile strength. So can be used for making small ornaments, shirt buttons, handles for spoon, forks etc.

KEY WORDS: *CASEIN, ACETIC ACID, POLYMERISATION, BIO- DEGRADABLE, NATURAL.*

I. INTRODUCTION

The main objective of our project is to use natural ecofriendly material to synthesis plastic instead of using non biodegradable materials. The availability of plastic is in ample amount in our country and this will develop new ways to utilize it. Casein is the family of phosphorous proteins which can bind together to form hard plastic polymer. These casein globules are present in sufficient amount in 'mammalian milk'/paneer. So our project is to convert these casein globules into hard plastic polymer. The end product of project is brittle and non flammable. It low to medium tensile strength. Another advantage is that it takes very less cost to manufacture plastic. It can be used for making small ornaments, shirt buttons, handles for spoon, fork and many more.

II. THEORY

As we all know Milk is a colloid, which is a suspension of large molecules such as proteins-water solution.

- As we all know that plastic are made up of polymers which too are the repetition of simple molecules called monomers, and like other plastics casein plastic is also made up of monomers called casein.
- Polymerization is a process of preparation of polymer by combining small molecules into long chain.
- Milk/Paneeris a rich source of protein such as casein which are nothing but phosphoprotein. cow milk contains about 80-85% of this casein.[2]
- When you heat milk and add an acid (in our case vinegar), the casein molecules unfold because hydrogen bonds present between oxygen and hydrogen molecule breaks and these hydrogen bonds are primarily responsible for the shape and different properties of protein. Because of this they become unstable and to gain stability they gets coagulated.
- Each casein molecule is a monomer and the polymer is made by joining many of these protein molecules together. The polymer can be moulded in any shape, which is why it is a plastic.[3]
- Now the amount of vinegar needed to give you the most plastic should be sufficient without enough vinegar the casein molecules do not unfold well, for making it difficult for them to link together into a polymer we need to add ample amount of vinegar.

III. PROCEDURE

To convert milk/paneer in plastic we have to follow a few simple steps.

1. Take the milk in vessel and Heat it to about 60-70 degrees centigrade in order to activate casein globules and stop heating.

2. Now to unfold casein globules in milk add about 25-30ml acid such as acetic acid (vinegar) per liter of milk.

3. Stir the above mixture to separate casein globules from watery residue. Now a mixture of casein globules and watery residue will form.

4. To extract casein globules from mixture filter it using a cheese cloth.

5. Take the filtrate on the filter paper and press it so that the water gets absorbed by the paper. This filtrate is nothing but consumable paneer itself. So you can use direct paneer also and mould it for further steps.

6. Now mould the filtrate in required shape and let it dry for 5-6 days to hold the given shape.

7. After about 15 days most of the water will evaporate giving us a hard plastic polymer.

8. After some polishing work using sand paper or polish paper the product is ready to use.[1]




IV. OBSERVATION

The final product gets much harder with drying and hence a long period of time is required to set it into a hard plastic.

This plastic readily absorbs any colours or dyes and hence can be given a variety of vibrant colours satisfying all market requirements

It gets a attractive and glossy finish with mechanical polishing using abrasive. Making it ready for consumer market.

The product is fully resistant to water and also resistant to heat to a large extent. Giving it longer life in use.

V. ADVANTAGES

1. The best part about this project is that it is completely ecofriendly so the plastic we get at the end is bio degradable and gives no harm of any type to the nature.
2. The polymer made is water resistant and also resistant to heat and direct flame to a great extent.
3. The entire process of manufacturing is also simple and does not require any state of the art hi-tech instrumentation or the chemicals which are hazardous or difficult to handle.
4. The entire process can be kept extremely simple n cost effective.

VI. CONCLUSION

1. Casein plastic can be successfully extracted from milk/paneer using a simple process.

2. The End product has adequate tensile strength make it difficult to break by casual drops.

3. A smooth finish can be imparted to it by some mechanical polishing making it ready for consumer market

4. The total cost of manufacturing is also limited so a broad variety of utilitarian products can be obtained using this type of plastic.

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REFERENCES

[1]. Basic idea of procedure: https://www.google.co.in/amp/s/m.wikihow.com/Make-%2522Plastic%2522-out-of-Milk%3Famp=1

[2] Amount of casein: http://googleweblight.com/i?u=http://www.milkfacts.info/Milk%2520Composition/Protein.htm&hl=en-IN

[3] Type of polymerization: https://www.sciencebuddies.org/science-fair-projects/project-ideas/Chem_p101/chemistry/turn-milk-into-plastic