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Short Communication

Biofabrics from Sodium Alginate

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ABSTRACT

This was a study meant to understand the properties and nature of biofabrics made with the help of sodium alginate, which is an extract of brown seaweed, sodium alginate as a substance is often used for baking purposes. The research aimed at the making of biofabrics from many different organic and inorganic materials like tea, beetroot, coffee, sugar, water, colored water and even salt water. The study aims at understanding and taking a step further at progressing the development of sustainable fabrics. Our biofabrics showcase the potential to significantly reduce the environmental impact associated with conventional textile manufacturing. Its properties can be customized to cater to a wide array of applications.

Keyword: Biofabrics; Sodium alginate; Elasticity; Calcium chloride; Glycerine

INTRODUCTION

Every year about 90% of the fabric manufactured around the world, ends up in landfills. And only 1% of it gets recycled. The traditional materials we use daily harm our environment and contribute to pollution and waste. Our solution to this problem was the idea of making biofabrics from alginate, a substance that is obtained from seaweed. Biofabrics represent an innovative frontier in science, blending the realms of biology and textile engineering to create sustainable and versatile materials [1].

The preparation of our biofabrics took a set of carefully orchestrated series of steps and procedures. In our study we have made use of cool and dry conditions for the making of our biofabrics.

DESCRIPTION

Materials

Sodium alginate: Sodium alginate is commonly used as a thickening agent in textile printing processes. When mixed with the liquid based solution, it formed a gel-like substance that helped control the spread and penetration of the liquid based solution on the canvas cloth used as base for casting the biofabric. Sodium alginate played a crucial role in fixing the liquid based solution to canvas and allowing it to dry by letting it transfer excess moisture to the canvas.

Solution of calcium chloride: Calcium chloride is often used as a coagulant in the production of biofabrics made from natural polymers like alginate. When we dissolved it in water and then brought it into contact with the liquid based solution, a chemical reaction called cross-linking took place. This reaction resulted in the formation of a gel-like network on top of the liquid solution, which provided structural stability and strength to the material. The gelation process helped the biofabrics maintain their shape and structure during production [2].

Calcium chloride is generally considered safe for use in bio-fabrication processes, especially when used in controlled concentrations. This makes it suitable for biofabrics that may come into contact with living organisms, such as medical textiles or wound dressings.

Glycerine: Glycerine is hygroscopic, which means it has the ability to attract and retain moisture. In our biofabrics glycerine was used to help maintain the fabric's moisture content. This can make the fabric more comfortable to wear and prevent it from becoming overly dry and brittle.

Glycerine is a biodegradable substance, which can be beneficial for biofabrics that are designed to be environmentally friendly. When disposed of, fabrics treated with glycerine are less likely to

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contribute to pollution and can break down more easily in natural environments [3].

Procedure

- Make a liquid base of your organic material, let's say you are making a biofabric out of beetroot, in order to do that use beetroot water or beetroot juice as your liquid base.
- Measure 200 mL of your liquid base in a beaker.
- Add 8 g of Sodium Alginate to this and blend the solution.
- Add 8 g of glycerin and blend again.
- Set the solution aside in a fridge overnight to remove the bubbles.
- The bubbles will now be at the surface, simply remove them with the help of a spoon.
- Fill a spray bottle with 100 mL of water and add 10 g of calcium chloride to it.
- Shake the bottle to dissolve the calcium chloride.
- Take a canvas cloth and place it in the stitch loop to make a surface for casting the fabric.
- Spray the canvas with your CaCl solution and pour on it your liquid based solution.
- Spray the top of the poured solution with CaCl solution again and dry extra water with a paper towel.
- Set the fabric aside in a dry place to let it set.
- Peel the fabric off after it has completely dried.

The biofabrics take variable days to dry depending on the material used to make the liquid base, for example beetroot takes about 3-4 days while tea may take about 2 days [4].

The period taken for drying of the biofabric also depends on how thick is the layer of the liquid solution that is casted on the canvas. Placing this cast solution in dry and sunny conditions can fasten the drying process, but too much of extra heat can cause the fabric to become brittle and lose its moisture content completely.

The biofabrics retained the color and aroma of the principle material used for their manufacture, for example the tea biofabric had a darker color and a strong aroma of tea showing the retention of properties. Same was the case with the coffee biofabric [5].

CONCLUSION

The biofabric made using salt water showed crystallization of salt crystals inside the fabric, giving rise to intricate patterns. Other than that salt was also found to separate out and be present at the bottom of the canvas base. The biofabrics made using tea and coffee were much more porous than other biofabrics like the ones made with beetroot. The biofabric made with brown sugar showed huge amounts of moisture loss, causing the fabric to become dry, stiff and solidified. The fabric still showed retention of brown sugar color. Overall, the fabrics were very stable and had good elasticity and tensile strength.

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STUDY LIMITATIONS

The study and manufacturing of the biofabrics was carried out in a single school lab located in Sharjah, UAE. The study was carried out with simple methods of production and the production of the biofabrics was carried out on a small scale. The study hence cannot be used to make larger generalizations about the biofabrics industry.

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