

# Anti Microbial Fabrics Manufacturing using the Benzalkonium Chloride in Antimicrobial fabric finishing

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**Abstract** — Antibacterial fabric manufacturing is a challenging task in textile industries. The fabric is the right living place for the bacteria, and it acts as a medium between the human and bacteria. The textile industries are concentrated more on antibacterial fabric manufacturing because it will increase the quality of fabrics and increase product sales. This paper proposes the benzalkonium chloride-based antibacterial fabric manufacturing in textile industries. This kind of antimicrobial agent provides better protection against bacteria for a long time. And also, it does not spoil the quality of fabrics like shrinking and tearing.

**Keywords** — Textile, Benzalkonium chloride, Antimicrobial agents, Antibiotic fabrics

## I. INTRODUCTION

Now a day the manufacturing companies are more concentrated on making antibiotic fabrics. The antibiotic fabrics protect the human from the micro bacterial attack. The fabrics are a good place for living microbial. Even though there are many antibiotics, the textile industries prefer only natural antibiotics because it does not degrade the quality of fabrics. This paper proposes the benzalkonium chloride as an antibiotic that is used for fabric finishing. The applications of Benzalkonium chloride are a lot in antimicrobial usages. For the growth of microorganisms' water, hydrogen peroxide, and sugar are needed. The Benzalkonium chloride is dissolved slowly in water, and it has less sugar content so that it resists the bacterial infection on the fabrics. Benzalkonium chloride applications include antiseptics for injuries, hand sanitizer manufacturing, preservatives in pharmaceuticals, and floor cleaner as disinfection. Benzalkonium chlorides are fast-acting antimicrobial agents against bacteria. The Benzalkonium based hand sanitizers are more effective in protecting the skin against bacterial infection, and less irritate for the skin. The reason for choosing the Benzalkonium chloride as an antibiotic agent is it works as long as possible.

## II. ANTIBIOTIC AGENTS

The antibiotics are the chemical agents that interrupt the reproduction and growth of bacteria. The antibacterial is classified as long-term antibacterial and short-term antibacterial. Some of the antibacterial compounds are work efficiently. Still, they disappear shortly, which are called short-term antibacterial, with the long-term antibacterial, they work effectively and appear as long as possible. The characteristics of antibiotics with respect to fabric manufacturing are as follows

- It must be work on a wide spectrum of its activity
- It should not be a nonallergic
- It must reach the human body to fight against the bacteria
- It must be chemically stable
- It must be easy to produce and inexpensive

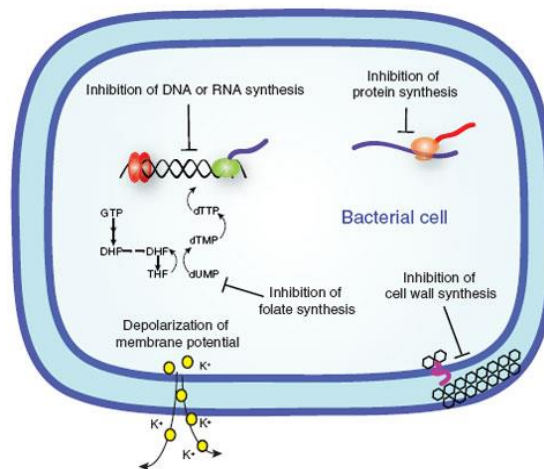


Fig.1 Function of Antibiotic

## III. PROCESS OF TEXTILE INDUSTRIES

The textile industry's manufacturing process is a more challenging task because it involves several processes which are start from fiber and finished with coatings. The manufacturing industries consist of the following process



- Spinning
- Weaving
- Dyeing
- Printing
- Finishing
- Garments manufacturing

The spinning is the process of converting raw cotton into yarn for the clotting process. The spinning process is categorized into two types one is hand-loom, and another one is power loom. Weaving is making the cloth from the yarn by warping the yarn as vertical and horizontal weft thread. Two types can make this machine one is a shuttle and shuttle-less machine. Dyeing is applying coatings in to / on to the fabrics to provide the colors and different shades among the fabrics. In this stage, the antibiotics are used to prevent bacterial infection in humans. With the printing process, the designs are made on the clothes as per the people's requirements. The printing can be done by five different methods such as block printing, screen printing, roller printing, ink-jet printing, carpet printing, heat transfer printing, photographic printing, warp printing, duplex printing, direct printing, and discharge printing. The finishing process is the final stage of the textile industry. In this stage, the clothes are washed, steamed, pressing, and packaging the cloth.

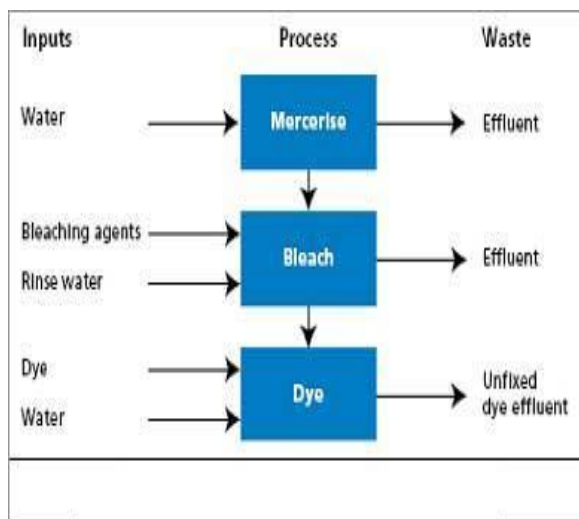
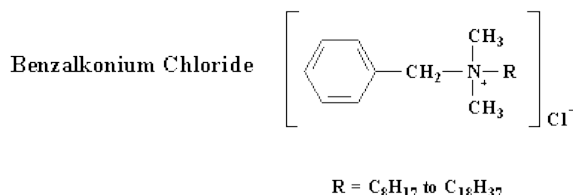


Fig.2 Textile Industry Finishing Process

#### IV. FUNTION OF BENZALKONIUMCHLORIDE

The BenzalKonium chloride is used as antibiotics for burns, scrapes, and injuries. The usage of BenzalKonium chloride is a lot in different fields. It should be used only externally. It can be used for skin antiseptics, sanitizers, wet wipes, sprays, and clothing industries. Before and after the use of BenzalKonium chloride, only use the limited dosage as per the

physician's direction. The BenzalKonium chloride is a delay to solute in water, and it has hydrochloride and less water content so that it is highly resistant against the micro bacteria. This can be used in fabrics industries to manufacture antimicrobial clothes. The chemical formation of BenzalKonium chloride is given below.



#### V. MICROENCAPSULATION TECHNIQUE

Because of the flexibility and versatility, the microencapsulation technique has become more popular. The microencapsulation techniques provide the following protection from the hazardous environment

- Oxidation
- Heat
- Moisture
- Alkalinity
- Acidity
- Evaporation

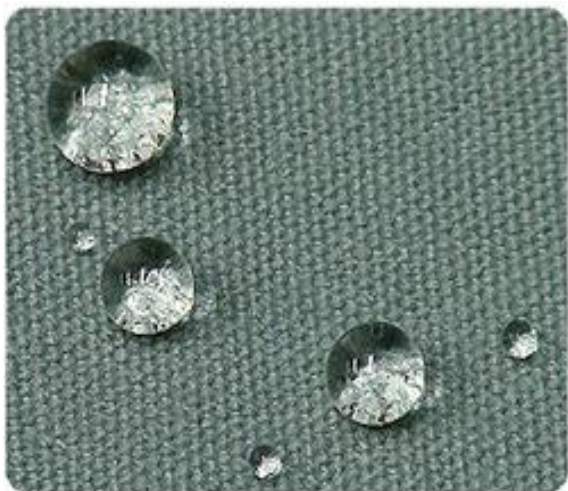
This technique is used for encapsulating the antimicrobial agents in the fabrics as microencapsulation. Which are consist of BenzalKonium chloride-based microencapsulation agents which are less dissolve in water and resist the affection of bacteria on the fabrics. There are many microencapsulation methods such as polymer to polymer incompatibility, complex coacervation, interfacialpolymerization, centrifugal extrusion, spray drying, pan coating, air-suspension coating, and emulsion hardening process.

#### VI. FINISHING TECHNIQUES

The finish is the most important stage in the fabric manufacturing textile industry; the finishing protects the cloth and peoples from the hazardous environment. Anti-UV pad-dry-cure is the traditional finishing techniques. The functional coatings are nowadays used because they can be used for different fabrics and their functions are different for individual fabrics. It consists of the minimum amount of additives, and it will adopt the different functionalities in simple way.

The BenzalKonium chloride is encapsulated in the finishing compounds such as cellulose and nylon to form the protective coating. The layer by layer approach is used to do the finishing process. It consists

of the sequentially arranged fabrication films which are equipped with antimicrobial additives. The chemical vapor deposition process is a suitable process to deposit the antimicrobial agents into the fabrics. The Benzalkonium chloride is the best antibiotic compound for the vapor deposition finishing process. These types of antimicrobial combinations are more resistant against the affection of bacteria and fungi from the hazardous environment.



**Fig. 3 Antimicrobial Coating**

## VII. CONCLUSION

The growths of functional textile industries are increased now a day with different types of fabric manufacturing. The challenging task behind manufacturing is the finishing process. The fabric must be protective against bacterial infections and hazardous environments so that the Benzalkonium chloride-based finishing compounds are used. Even though the finishing process is advanced, there are some defects in the quality of fabric manufacturing, it is taken as future work. Without degrading the fabric quality, the microbial protection is provided.

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