Anti Microbial Fabrics Manufacturing using the BenzalKonium Chloride in Antimicrobial Fabric Finishing

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Abstract
The antibacterial fabrics manufacturing is a challenging task in textile industries. The fabric is a good living place for the bacteria and it act as a medium between the human and bacteria. The textile industries are concentrates more on antibacterial fabrics manufacturing because it will increase the quality of fabrics and also increase the product sales. This paper proposes the benzalkoniumchloride based antibacterial fabric manufacturing in textile industries. This kind of antimicrobial agents provides a better protection against the bacteria as long time. And also it does not spoil the quality of fabrics like shrinking and tearing.

Keywords — Textile, Benzalkoniumchloride, Antimicrobial agents, Antibiotic fabrics

I. INTRODUCTION
Now a day the manufacturing companies are more concentrate on making antibiotic fabrics. The antibiotic fabrics protect the human from the micro bacterial attack. The fabrics are good place for living microbial. Even though there is lot of antibiotics the textile industries prefers only the natural antibiotics because it does not degrades the quality of fabrics. This paper proposes the benzalkoniumchloride as an antibiotic which is used for fabric finishing. The applications of BenzalKonium chloride are lot in antimicrobial usages. For the growth of micro organisms’ water, hydrogen peroxide and sugar are needed. The BenzalKonium chloride is dissolve slowly in water and it has less sugar content so that it resists the bacterial infection on the fabrics. The applications of BenzalKonium chloride are lot such as antiseptics for injuries, hand sanitizers manufacturing, preservatives in pharmaceuticals, floor cleaner as a disinfections. BenzalKonium chlorides are fast acting antimicrobial agent against the bacteria. The BenzalKonium based hand sanitizers are more effective to protect the skin against the 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 which are interrupt the reproduction and growth of bacteria. The antibacterial are classified as long-term antibacterial and short-term antibacterial, some of the antibacterial compounds are work efficiently but disappears shortly which are called short-term antibacterial, with the long-term antibacterial they work effectively and appears as long as possible. The characteristics of antibiotics with respect to the fabric manufacturing are as follows

- It must be work on wide spectrum of its activity
- It should not be a non allergic
- 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 industries manufacturing process are more challenging tasks, because it involves several processes which are starts 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 the raw cottons into yarn for clothing process. The spinning process is categorized as two types one is hand looming and another one is power looming. Weaving is the process of making the cloth from the yarn by warping the yarn as vertical and horizontal weft thread this can be made by two type of machine one is shuttle and shuttle-less machine.

Dyeing is the process of 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 the bacterial infection to the humans. With the printing process the designs are made on the cloths as per the people 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 textile industries in this stage the cloths are washed, streamed, pressing and packaging the cloth.

![Fig.2 Textile Industry Finishing Process](image)

IV. FUNCTION OF BENZALKONIUMChLORIDE

The Benzalkonium chloride is used as antibiotics for burns, scrapes and injuries. The usage of Benzalkonium chloride is lot in different fields. It should be use 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 direction of physician. The Benzalkonium chloride delay to solute in water and it has hydrochloride and less water content so that it is highly resistance against the micro bacteria. This can be used in fabrics industries to manufacture the antimicrobial cloths. The chemical formation of Benzalkonium chloride is given below.

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\text{Benzalkonium Chloride} = \text{CH}_3 - \text{CH}_2 - \text{N} - \text{R} - \text{CH}_3 \quad \text{Cl}^-
\]

R = C₄H₉ to C₃₄H₇₈

V. MICROENCAPSULATION TECHNIQUE

Because of the flexibility and versatility the microencapsulation technique is become more popular. The microencapsulation techniques provides 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 a 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 lots of microencapsulation methods such as polymer to polymer incompatibility, complex coacervation, and interfacial polymerization, 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 now days used because it can be used for different types of fabrics and its functions are different for individual fabrics. It consists of minimum amount of additives and it will adopt the different functionalities of in simple way.

The Benzalkonium chloride is encapsulated in the finishing compounds such as cellulose and nylon to form the protective coating to the fabrics. The layer by layer approach is used to do the finishing process, it consist of the sequentially arranged fabrication films.
which are equipped with antimicrobial additives. Chemical vapor deposition process is the suitable process to deposit the antimicrobial agents in to the fabrics. The BenzalKonium chloride is the best antibiotic compound for vapor deposition finishing process. These types of antimicrobial compounds are more resistance against the affection of bacteria and fungi from the hazardous environment.

![Fig. 3 Antimicrobial Coating](image)

VII. CONCLUSION

The growths of functional textile industries are increased now a day with different types of fabric manufacturing. The challenging task behind the manufacturing is finishing process. The fabric must be protective against the bacterial infections and hazardous environment. 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 a future work. Without degrading the fabrics quality the microbial protection is provided.

REFERENCES