

AN OVERVIEW OF CHITOSAN IN ANTI WRINKLE TREATMENT OF COTTON

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Abstract

Cotton is the most commonly used cellulosic fiber used to wear clothes. Nowadays everybody wishes their dress retains its original shape like just ironed. Anti wrinkle finish gives the anti wrinkle, comfort and aesthetic look which are broadly used in the textile industry. The demand for cotton fabric grows day by day. The conventional method of anti wrinkle finish contains formaldehyde which causes human carcinogenic. Chitosan has been used in the textile industry to create functional fabrics as an environmentally friendly finishing agent. In this article will provide the brief overview of chitosan's application in anti-wrinkle treatment in textile industry

Key words: Cotton, anti-wrinkle treatment, Chitosan, textile processing.

1. Introduction

Conventional material items from filaments like fleece, cotton, silk, polyester, and so on. are unable to meet the growing demand for applications in healthcare, industry, aesthetics, and comfort. In the fashion and textile industries, functional fabrics with antibacterial, anti-wrinkle, dyeing, antistatic, and other special properties have received a lot of attention. Chitosan is a product that is made by deacetylating chitin and is found in a lot of natural things (like shellfish, insects, and some fungi). Due to its versatile biological effects, including antibacterial, antifungal, antitumor activity, and low immunogenicity, as well as its excellent biocompatibility, biodegradability, ecological safety, and non-toxicity, it has multiple applications in the biomedical and other fields. In the textile industry, chitosan has been used as an environmentally friendly finishing agent to create functional fabrics. Chitosan's applications in the antibacterial, anti-wrinkle, dyeing, and antistatic finishing of textiles.

2. Literature review

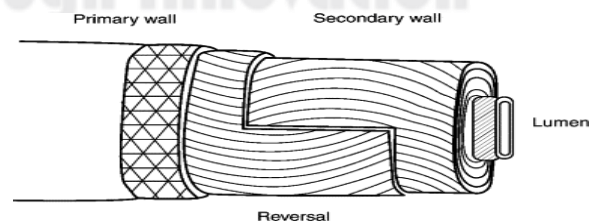
2.1 chitosan: Chitosan is a chitin-derived polysaccharide. Depending on the source of chitin, its molecular weight typically ranges from 300 to 1000 kDa. Chitin is the second most common natural polymer in the world, after cellulose. It is found in crab and shrimp shells and can be degraded into non-toxic residues. The rate of degradation is strongly correlated with the polymer's molecular mass and degree of deacetylation, and it has been shown to be biocompatible with physiological medium in some way. Chitosan is an outstanding candidate for biomedical applications due to its unique properties.

Chitosan is made from shells, like those of crabs and shrimp. These shells contain 30-40% proteins, 30-half calcium carbonate and 20-30% chitin. Chitosan is produced in four stages: demineralization (DM),

deproteinization (DP), decolorization (DC), and deacetylation (DA). The deacetylation of chitin, which is obtained from the shells of crabs or shrimp, is the process by which chitosan is formed. Typically, chitosan is deacetylated between 70% and 95%.

2.2 cotton structure: The purest form of natural cellulose can be found in the seed hair of *Gossypium* plants, which produce cotton. It is an important fiber for textile applications due to its numerous desirable fiber properties. The most important raw material for the textile industry is cotton. The structure of a cotton fiber is made up of microfibrils, which in a typical orientation form the primary cell wall and the three layers of the secondary cell wall. Cotton fibers range in length from 10 to 60 millimeters and in fineness from 1 to 4 dtex. The majority of cotton fiber lengths are between 25 and 30 mm. Between 1.50 and 1.54 g/cm³.

3. Figure: 2.2 Chemical structure of cotton



The structure of cotton fiber is fibrillar. Non-cellulosic polysaccharides account for up to 10% of the weight of the cotton fiber, with cellulose accounting for 88 to 96.5 percent. In mature fibers, the primary wall is only 0.5 to 1 μm thick and contains approximately 50% cellulose. Proteins, pectins, and natural colorants are examples of non-cellulosic components. Concentric layers with alternately shaped twists make up the secondary wall, which is made up of about 92% to 95% cellulose. The layers are made up of elementary fibrils arranged into micro and macro fibrils and packed tightly together. Strong hydrogen bonds hold them together. The center of the fibers is the lumen. Almost all of cotton is made of the polysaccharide cellulose. Cotton cellulose is made up of crystalline fibrils that vary in length and complexity and are connected by less organized amorphous regions. The average ratio of crystalline to non-crystalline material is about one-third, depending on how it is measured.

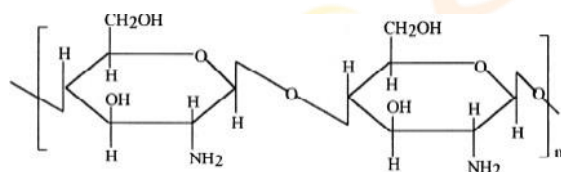


Figure: 2.1 Chemical structure of chitosan

4. Causes of wrinkle formation in cotton fiber

Wrinkles are caused by heat and water. The bonds that hold polymers in place within a fabric's fibers are broken by heat. When the bonds are broken the fibers can move into new positions because they are less rigid in relation to one another. New bonds form once fabric cools, locking the fibers into a new shape. Both ironing and letting clothes cool in a heap straight out of the dryer will result in wrinkles because of this. Not all fabrics are similar to this kind of wrinkling. Polyester, wool, and nylon all have a temperature known as the "glass transition," or temperature above which the polymer molecules are more fluid, or glassy, and below which they are almost crystalline in structure.

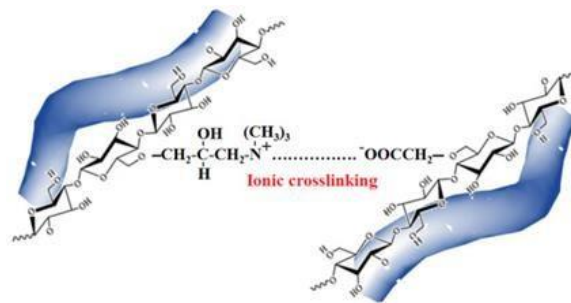


Figure: 3 wrinkle forming

Cotton, linen, and rayon are examples of cellulose-based fabrics that wrinkle when exposed to water. Hydrogen bonds, which are the same bonds that hold water molecules together, connect the polymers in these fabrics. Water molecules can get into the spaces between the polymer chains through absorbent fabrics, allowing for the creation of new hydrogen bonds. As the water evaporates, the new shape is locked in place. These wrinkles can be effectively removed with a steam iron.

The resistance to deformation and the recovery from deformation are its two components. Strong mechanical forces are what cause creases to form. Wrinkle recovery will be reduced if covalent crosslinking is not available. To achieve recovery, strain energy that is stored during bending should be released. When covalent bonds are present, strain energy is stored and the bonds are stretched but not broken. Therefore, if the forces are released, they want to recover by releasing the stored energy from the bending process. We must create intermolecular crosslinks if they are not present naturally. Covalent links can only be made with the help of a crosslinking agent. The majority of the crosslinking agents are bifunctional. Most of the time, polyfunctional crosslinking agents aren't used because they can make the fabric stiffer by creating a three-dimensional network.

5. Mechanism of resiliency

A chitosan solution is prepared by dissolving chitosan in 1% w/v acetic acid. The fabric is then finished in the chitosan solution using the standard dipping, rolling, and baking method. After drying, the chitosan solution forms a water-insoluble protective layer on the fabric's surface, strengthening it and making it less likely to deform. Additionally, a large number of intermolecular hydrogen bonds are formed between the hydroxyl and amino groups of chitosan and the polar residues of the fiber molecules in the micro-pores filled by chitosan macromolecules. The

fibers' amorphous regions are strengthened and their mobility is reduced as a result, making the fabric resistant to wrinkles. According to a study on the use of chitosan to finish cotton fabrics to prevent wrinkles, the fabric's wrinkle resistance improved with increasing chitosan content.

6. Conclusion

Because of its primary qualities, chitosan can be effortlessly mixed with conventional textile fibers like fleece, cotton, silk, and polyester with great compatibility and strong interactions. Chitosan can be used as a finishing agent or fiber modifier to produce functional textiles that have anti-wrinkle properties. Chitosan's use in the textile industry not only increases fabrics' value and performance, but it also encourages natural resource conservation.

7. References

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