

PRE-TREATMENT OF DIFFERENT FIBERS – PART XIV

REF: TT/ FEBRUARY 2021/ WK 4

MERCERIZATION OF COTTON

Mergerization is one of the important pre-treatment processes. This process improves absorption property of the cotton fibers and imparts better dye affinity. Apart from this, mergerization also improves luster and hand feel of the fiber.

Mergerization can be done in both yarn and fabric form. Woven fabrics are mergerized in full width form and knitted fabrics can be mergerized either in full width or tubular form. Mergerization can be done at any stage of pre-treatment such as on greige fabric, after desizing or after desizing, scouring and bleaching etc.

In the conventional mergerization process, the fiber is treated with concentrated solution of caustic soda for short period of time, which is followed by washing-off and neutralization. The main mergerizing agents in this process are caustic soda, alkali resistant penetrant, acetic acid, etc.

Alkali resistant penetrant accelerates the wetting property and penetration of alkali solution. Mergerized cotton is hydrated cellulose, i.e., chemically it is identical to the original cellulose, but differing from it in physical properties. Fiber swelling and longitudinal (Length wise) shrinkage modifies the morphological structure and the physical properties of cotton.

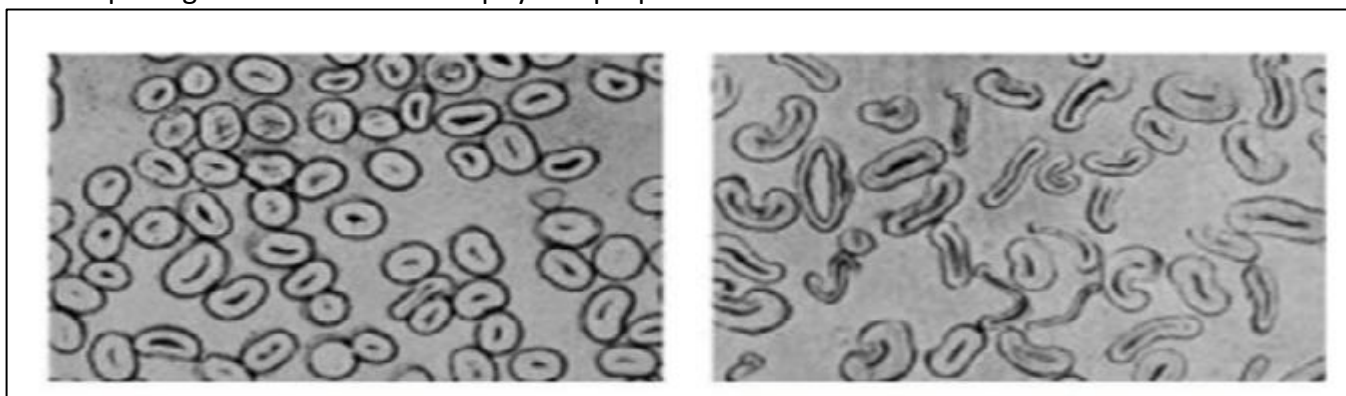


Fig 1.1 Cross-Section of cotton fiber (Before Mercerization Vs after Mercerization)

Ref: slideshare.net

Mechanism of Mercerization

When cotton fiber is treated with concentrated caustic soda, sodium ion enters into both amorphous and crystalline regions of the fiber at the same time. It results into the formation of a hydration layer



around the water molecules around the sodium ion. The sodium ion enters into the fiber and combines with the fiber, the water molecules also enter at the same time. This result into swelling of the cotton fiber - the diameter of the fiber increases, shrinkage occurs along the longitudinal direction and the cross section of the fiber changes from bean shape to round shape. Due to tension on the fiber, the uniformity of the fiber increases and subsequently the surface smoothness too increases. After mercerization, the crystallinity of cotton fiber is reduced. The dyeing performance improved due to the decrease of crystallinity.

Chemically, under the action of concentrated alkali, structural modifications of cellulose take place. The Cellulose I (Basic cellulose) forms alkali cellulose I with concentrated sodium hydroxide. After washing and neutralization cellulose II is formed.

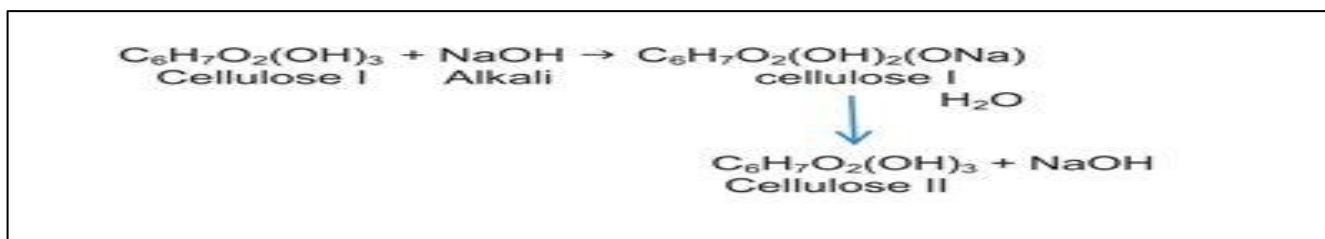


Fig 1.2 Effect of Alkali on cellulose

Ref: textiletoday.com.bd

Precautions during Mercerization

Following precautions must be taken during the mercerization process.

- The temperature of alkali solution should be kept stable.
- Fabric should be kept under certain tension for better luster.
- Fabric must be kept flat to prevent curling.
- Alkali resistant penetrants must be used to improve the mercerizing effect.
- The pH value of mercerized fabric must be kept neutral.

References:

1. <https://www.textiletoday.com.bd/>
2. <https://www.dttwister.com/>
3. <https://inpressco.com/>

.....To be continued.....

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Last week`s Answers: 1) SILICATES 2) STABILIZER 3) CONCENTRATION 4) PEROXIDE

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