

Mercerization is one of the most important finishing processes of cotton with a strong caustic alkaline solution in order **to improve the lustre, hand and other properties**. It imparts gloss to the fibre, increases its hygroscopicity, strength and improves its dye affinity. Mercerizing improves the reactions with a variety of chemicals and elongation of the fibres and also improves the stability of form.

Mercerizing process consists in treatment of cellulosic materials with **concentrated solutions of caustic soda at a temperature of 15 to 18°C**. Mercerised cellulose is hydrated cellulose, i.e., a product which from the chemical point of view is identical to the original cellulose, but differing from it in physical properties.

Mercerizing Process

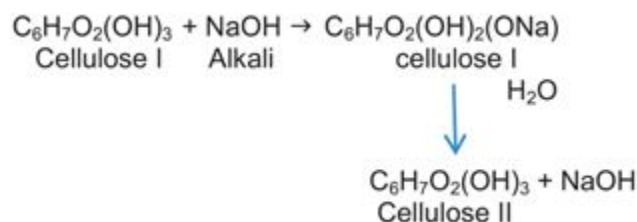
The process, done in a continuous way, involves four subsequent steps:

- Impregnation of the material in relaxed state, cold caustic solution of required strength and wettability.
- Stretching while the material is still impregnated in the caustic solution.
- Washing off the caustic soda from the material while keeping the material still in the stretch state.
- Neutralizing with acids and rinsing.

Changes after mercerization:

Physico-chemical changes during mercerization:

Under the action of concentrated alkaline solutions chemical, physico-chemical and structural modifications of cellulose take place. Native cellulose (Cellulose I) forms alkali cellulose I with concentrated sodium hydroxide. On washing and neutralisation cellulose II is formed.

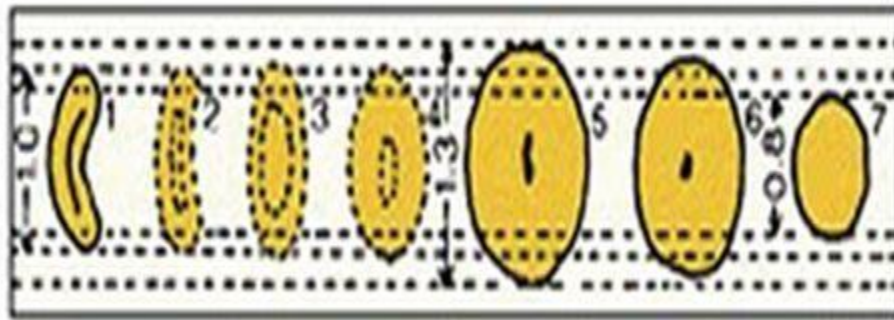


As a result of the penetration of the alkali into the lattice, internal hydrogen bonds are broken and in Cellulose II the number of available hydroxyl groups (-OH) is increased by around 25%. The

treatment with alkali and subsequent washing may be performed so that the fabric or yarn may either freely contract or they may be held under tension.

Increases fibre lustre:

Concentrated solutions of caustic soda cause considerable swelling of cotton fibre. The changes in cellulose physical properties are being irreversible. When the fibre swells, its volume undergoes considerable changes; at maximum water absorption, the cross section of cotton fibre is increased by 40 to 50% with inconsiderable increase in length (about 1 to 2%). Swelling of fibre changes its cross section from squashed circular pipe shape to an oval shaped.



1. Before mercerizing, 2-5. Swelling stage with 18% sodium hydroxide, 6. Washing stage after mercerization, 7. Final stage

The main factors influencing the factors of selling are temperature of treatment, the concentration of the alkali in the solution and additions made to the solution.

Increases tensile strength:

When cotton fibre, yarn or cloth is mercerized, its **strength increased by 10-50%**. The tensile strength increase depends on various factors, such as temperature of impregnation, concentration of alkali in impregnating bath, construction of yarn etc. Lower the temperature of mercerization, greater is the tensile strength (breaking load of the yarn). Increase of alkali concentration up to 52° Tw, tensile strength increased gradually and further increase of alkali concentration decrease the tensile strength. For long staple fibre yarn, greater the twist, greater is the tensile strength of mercerized material.