TECHNICAL TUESDAYS

PRE-TREATMENT OF DIFFERENT FIBERS – PART II

REF: TT/ DECEMBER 2020/ WK 1

A) Pre-treatment of Silk (Continued…)

In pre-treatment of silk, main process involved is degumming, which is necessary to remove the natural gum i.e. Sericin and the natural oils and organic impurities. Degumming makes the silk yarn/fabric soft and lustrous.
Besides Sericin which is the main impurity in silk fiber, these fibers may also contain sizing agents like starch, CMC, gum tallow etc. These impurities may not be get removed by regular degumming process. In such cases, desizing is carried out before degumming treatment. Desizing is done using Sulphuric acid (0.5%) at recommended temperature and time. Desizing is followed by thorough washing and subsequently degumming. In some type of silk in which only 2 to 5% in weight of silk gum is removed, silk can be prepared by simply washing the raw silk in hot water without the use of soap. This is used mainly for warp; hence the gum is left purposely.
Naturally silk is cream in color which is preferable and sold in the market. However, if white silk is required, then bleaching is also carried out.

Degumming of Silk – It is the process for removal of Sericin from the fibroin. The long protein molecule of Sericin is broken down into smaller parts by hydrolysis. These are easily dispersed or solubilized in hot water. Hydrolysis of proteins can be carried out by treatment with acids, alkalis and enzymes. Another method which is commonly in practice is boiling off in soap solution. Sometime quantity of the natural gum has been allowed to remain on the silk fiber to give it additional body and to make it easier to handle in spinning and weaving.

Following are different processes of degumming.

- **Boiling Off in Soap -** Soap is a good degumming agent and fabrics can be degummed by treating with soap solution at close to boiling point. Typically, silk fiber is boiled in soap solution containing soap and wetting agent at 90°C–95°C for 1-2 hrs. pH of the bath must be maintained at 9.5-10.5. If the pH is above 10.5, the weight loss will be more.

  After degumming, the silk is thoroughly washed with hot and cold water, with weak solutions of ammonium chloride or soda ash to remove the hydrolyzed gum. The actual dosage and time is recommended as per the requirement. In some cases like for delicate varieties of silk, a two bath

method is also followed. The second degumming bath contains half the quantity of soap taken for the first degumming bath and the duration of treatment is also divided equally between each bath.

In order to avoid stains by the deposition of soap deposits, sequestering agent can be added in the bath to correct the hardness of water. Neutral soaps have no degumming property as the free alkali present in them is negligible.

- **Degumming with acids and alkalis** - Silk degumming in aqueous solutions of acids and alkalis largely depends on pH and temperature. An alkaline reaction at a pH more than 9 and acid reaction at pH less than 2.5 ensure a rapid elimination of Sericin completely after 30 min of treatment. The temperature should not exceed 95°C to avoid weakening of the fiber.
  Alkali hydrolyses protein by attacking the peptide bonds and are said to have severe damaging effect on proteins. Hence, this process has to be carried out under controlled condition, so as not to result in over degumming. Alkalis attack both the proteins present in the silk i.e., sericin and fibroin. However, the variation in the rate of hydrolysis controls the reaction.
  Acid degumming is a safe method, as organic acids are used and they are less aggressive on silk than that of mineral acids.

- **Enzymatic degumming –** Enzymatic degumming is also gaining lot of importance. Enzyme which can hydrolyze the sericin is classified as proteolytic enzymes. The proteolytic enzymes cleave the peptide/amide linkages and convert them into amino acid. Mainly there are three types of proteolytic enzymes such as zinc protease (e.g. carboxy peptidase A), serine protease (Chymotrypsin, Trypsin, Thrombin) and thiol protease (acts as cystine residue in the protein). The function of proteolytic enzymes in their degree of degumming depends on the pH of the bath and the optimum activity is found to be different at different pH for different enzymes. The degumming process is recommended to be carried out in two steps. In the first step only, gum is removed by enzymatic treatment and in the second step natural waxes and oil stains are removed by treatment with soda ash followed by cold water washing twice.

Reference: textilestudycenter.com

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

UNSCRAMBLE THE JUMBLE WORDS
ILDM
EINSPROT
TEASEPRO
ZYENMME

Last week`s Answers: 1) IMPURITIES 2) SILK 3) PRETREATMENT 4) DEGUMMING

Wishing you a great week ahead!

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