USE "COLD" DYEING TECHNOLOGY FOR TEXTILE

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The goal-oriented selection of dyes and dyeing technology that would guarantee not only the desired range of colours, but also more complete and effective use of the potential resource of the warp of fabrics, has a significant importance in ensuring uniform wear of the fibrous warp and colour of linen-containing textile materials. However, it should be emphasized that a limited number of works have been published to assess the role of basic, final and special treatments of linen-containing fabrics during wear after their wet cleaning. Therefore, in our studies on mixed linen–cotton fabrics intended for manufacturing dresses and shirts, the following tasks have been addressed: to study the dependence of colour fastness of the tested fabrics, under the effect of repeated washes, on the reactive dye used and its concentration in the dye bath; to make a comparative analysis of the colour fastness to washing of linen–cotton fabrics dyed with reactive dyes by the "cold" and classical dyeing technologies.

Providing the desired colour fastness of textile fabrics to repeated washing has always been and remains relevant. Many researchers have devoted their work to solving this problem. Some authors have studied the role of fibrous composition and other structural parameters in the formation of colour fastness in textile materials under the action of washing, others focused their investigation on the effect of processing these materials on their colour fastness to wet treatments, and only a few researchers examined the influence of fibre structure and treatment methods of textile materials on their resistance to these factors.2-4. It is known that dyeing of flaxcontaining fabrics at an industrial scale is associated with significant consumption of heat and electricity. Therefore, it is of considerable interest to reduce the share of heat treatments or perform them at lower temperatures. Nowadays, this problem is especially relevant as most companies have difficulties with a stable supply of steam and electricity, which makes it impossible to maintain the temperature parameters of the dyeing process. The roles of fibrous composition, structure and processing of textiles in the kinetics of their wear under the effect of repeated washes have been also examined by Xiao and Zhao, Rizk and Ibrahim, Pugachevsky, Semak, Halika, Cosmic and others. Still, the need to investigate the issues addressed in this work comes from the fact that in previous research publications on textile materials, the intensity of their wear taken as the frequency of washes is assessed, as a rule, separately, by examining the changes in the mechanical properties and colour fastness. However, it should be kept in mind that colour fastness generally decreases much faster than the mechanical properties of cellulose textile materials [1-4].

The dyeing procedure was carried out in the laboratory of "DC Khimteks" (Kherson), according to two technologies: the "cold" resource-saving technology developed at "Khimteks", with a pad dyeing range for the concentration of each type of reactive dye (Reakol) in the dye bath, between 10 and 30 g/L; the traditional dyeing technology with a continuous pad-steam dyeing process, using the same types of dyes, but at the concentration of each dye in the dye bath of 2.0 and 3.0%. The composition of the dyes is a trade secret. The "cold" dyeing technology consisted of 3 stages: material preparation, dyeing and washing, as detailed below. 1. Material preparation: combining decoction and bleaching – for successful dyeing with reactive dyes, the preliminary preparation of the material is very important. The fabric was treated under the following conditions: Kolovet AN – 0.8-1.0 g/L, caustic soda – 2.0 g/L; hydrogen peroxide – 2.0-4.0 g/L, peroxide stabilizer – 1.0 g/L, bath ratio of 1:10; temperature 98 °C, time 45-60 min, which allowed achieving high purity and capillarity of the material for successful subsequent dyeing. 2. Dyeing was carried out under the following conditions: Reakol dye concentration (X%) varied according to the desired colour (for deep black colour (Reakol black meta) – 6%, for deep blue colour (Reakol sea blue) – 3%, for other colours – between 0.3 and 3.0%); leveller Cololevel P – 0.5-1.0 g/L (except for black); salt – Y g/L; caustic soda – Z g/L; bath ratio – 1:10, temperature – 60 °C. 3. Washing was performed in the following steps: 1) cold washing; 2) neutralization (0.5 g/L acetic acid (50%) at 40-50 °C, for 5-10 min); 3) hot washing with a cleaning agent; 4) warm washing (Kolosoap A – 1.0 g/L, acetic acid – 1.0 g/L, time – 15 min).

The colour fastness of the tested fabrics to repeated washes was determined by observing the variation of the indices of general colour contrast (ΔE) and colour intensity (values of function GKM, K/S) after 5, 10, 15 and 20 washes. Spectral characteristics of the colours were obtained using a system of measurement and colour reproduction, which included: a Spectro Scan 5100 Spectrophotometer, a computer and a colour analysis software package. Colours were determined under standard emission (illuminant D65 and 10° observer). Colour characteristics were calculated by the CIELab system [1-4].

The findings of the study demonstrate that dyeing linen–cotton fabrics by the "cold" technology is a viable option, due to a number of advantages. The dyeing process is carried out at ambient temperature, without the use of heat. This technology involves less fabric preparation and does not require complex equipment. Consequently, this procedure uses lower amounts of water during processing and improves the working conditions. Moreover, it has been established that the "cold" technology of dyeing, in the case of the studied fabrics and dyes, allows obtaining similarly resistant dyeing to repeated washing as by the classical technology.

References:

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