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IMPROVEMENT OF TECHNOLOGY FOR OBTAINING BONDING WATER-SOLUBLE POLYMERS FOR COLORING OF MIXED FABRICS

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Abstract

Changes in the color intensity index (K/S) from the concentration of components in the composition have been studied. It was found that the intensity of coloring of silk-acetate fabric with dyed dispersed ruby C mainly depends on the concentration of binders in the compositions. The dependence of the intensity of coloring on the temperature during dyeing is determined by the example of various dispersed dyes.

Keywords: *Fiber, composition, concentration, dye, binders, color intensity, fabric, polymer, PVA, acrylic emulsion.*

Introduction

In the finishing production of the silk-winding industry, as in any other industry, there are acute problems of production ecology, saving natural and energy resources, since the technologies for coloring and final finishing of mixed fabrics based on silk and acetate fibers involve toxic chemical materials and dyes with high water consumption and electricity[1-3].

The development of resource- and energy-saving, environmentally friendly dyeing technologies based on domestic preparations with the possibility of combining with final finishing as binding and thickening ingredients is an urgent scientific problem, the solution of which is of great practical importance.

In connection with the growth in the production of water-soluble dispersions of acrylic polymers in the chemical industry, the opportunity has arisen to improve and develop import-substituting technologies for dispersed coloring, surface modification of mixed materials to improve coloristic properties and combined with final finishing, giving additional effects, including reflective ones. The introduction of new technologies for dyeing and imparting functional properties to mixed fabrics based on silk acetate fabrics will lead to a reduction in economic costs as a result of replacing expensive imported binders, and thereby allow binder-thickening manufacturers to expand the scope of consumption and become competitive in the global market of functional binders.

In this regard, this report presents the results of studies on dyeing mixed fabrics based on silk and acetate fibers with water-soluble polymers as binding and thickening reagents of the dye with the fabric.

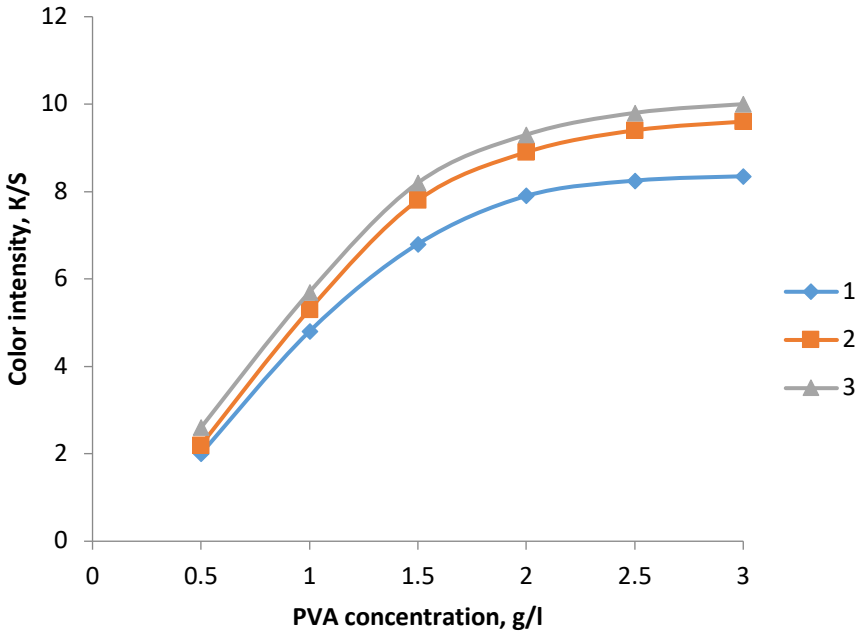
At the same time, special attention is paid to the technological aspects of creating an effective binder, which involves surface modification with polymers, i.e., applying a polymer preparation to the surface of the fabric, which makes it possible to improve both the coloristic characteristics

of mixed silk-acetate materials and provide various types of final finishing. Therefore, the results of studying the coloristic and technical properties of printed fabrics in the presence of water-soluble binders with the aim of developing new technologies, including combined methods of coloring and finishing, are in demand.

It is known that as a result of applying polymer coatings to a painted material, despite the improvement in the strength of the colors, in many cases a weakening of the intensity, clouding or a noticeable change in the shade of the painted material can be observed. This is obviously due to the nature of the ingredients used as a binder [4-7].

In this regard, it was interesting to evaluate the effect of surface modification of the polymer on the quality of paints. In Fig. 1. shows a curve of changes in the intensity index (K/S) of color depending on the concentration of polyvinyl acetate in the binding composition. As can be seen from the data obtained, with increasing concentration of PVA binder, the color intensity increases. This pattern is observed up to a binder concentration of 2.0 g/l, and further increases in concentration have a negligible effect on the color intensity. When AE (Fig. 1, curve 3) and OP-10 (Fig. 1, curve 2) are introduced into the binder composition, an increase in color intensity is observed compared to only PVA binder. For example, at a PVA concentration of 1.5 g/l, the color intensity is 6.4 units. K/S, and at the same concentration of PVA and with the introduction of AE and OP-10 into the binding composition, the color intensity is up to 7.8 and 8.5 units. K/S accordingly.

These, the developed composition, including a dye and binder-thickening agents for dyeing, allows, while achieving high color results, to reduce the technological and economic costs of the process of dyeing mixed materials based on silk and acetate fibers.

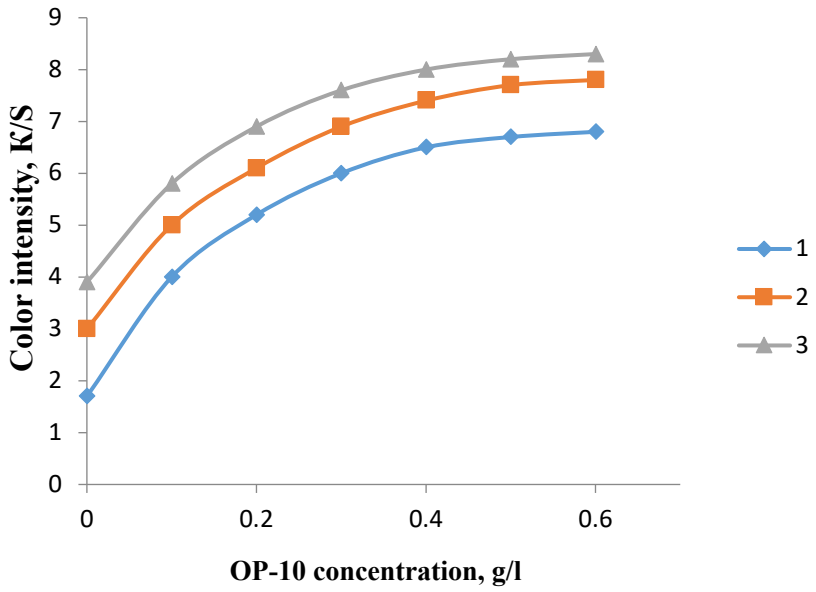


Rice.1. Curve of changes in color intensity index (K/S) depending on the concentration of components in the composition. 1-PVA without adding a modifier; 2- PVA with the addition of OP-10 0.5%; 3- PVA with the addition of AE 1.0%.

In addition, an important advantage of squeegee application of a dye composition is the possibility of significantly reducing (or eliminating) the use of water in the coloring process, and, consequently, solving the environmental problem associated with resource saving. The developed

composition, intended as a binder for dyeing mixed materials with dispersed dyes, is effective in relation to color intensity.

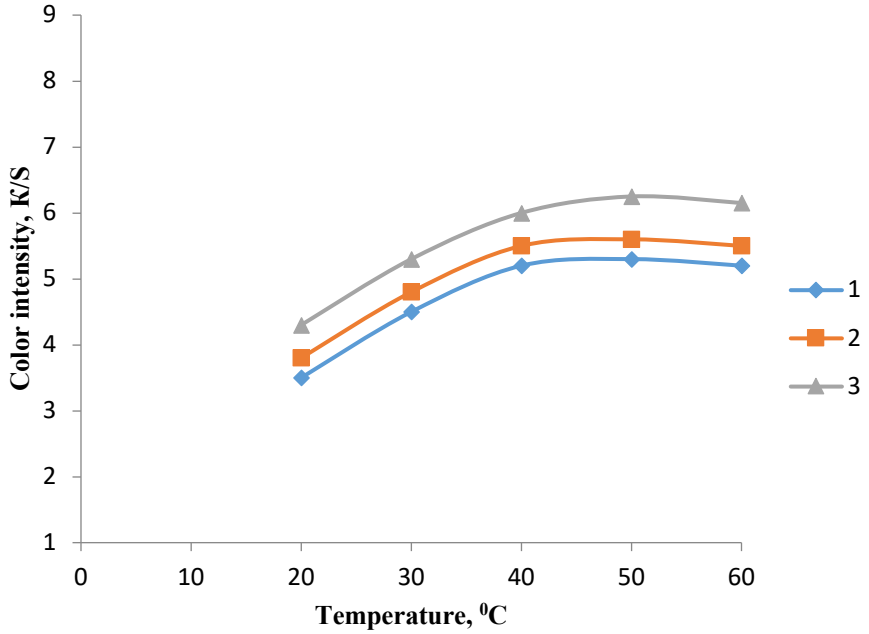
The conducted studies prove the possibility of using developed composition in the processes of dyeing mixed fabrics based on silk and acetate fibers. As shown, a composition based on PVA, AE and OP-10 can act as both the main dyeing component when coloring mixed fabrics with disperse dyes, and as a surface modifier for silk-acetate materials. Developed technology for dyeing silk-acetate fabrics using binder PVA, AE and the drug OP-10 as one of the most effective compositions, allowing to achieve maximum results in the intensity of the resulting colors. Dyeing was carried out in accordance with the technology adopted in production. An important factor in dyeing is determining the effective concentration of each component of the binding composition.



Rice. 2. Color intensity of silk-acetate fabric with dyed dispersed ruby C, with different concentrations of binders in compositions. 1-OP-10; 2- AE; 3-PVA.

In order to determine the optimal formulations of the dyeing binder, the change in color intensity at various concentrations of PVA, AE and OP-10 was assessed. The concentration of each binder in the composition varied from 0.5 to 3.0; from 0.2 to 1.2; and from 0.1 to 0.7 g/l, respectively.

The data presented in Fig. 2 indicate that the optimal concentration of binding components in the composition at which the maximum color intensity is achieved, PVA, AE and OP-10 are 1.5-2.0, respectively; 1.0-1.5 and 0.5-0.6 g/l.



Rice. 3. Dependence of color intensity on temperature during dyeing using the example of disperse dyes: 1-disperse violet 2C, 2-disperse scarlet F, 3-disperse ruby C.

The limiting factor in both the binder preparation and dyeing process is the effect of temperature on the physicochemical and coloristic properties of the binder and finished fabrics. In this regard, we studied the influence of temperature on the technological process of dyeing with various types of colored disperse dyes. Analysis of the data (Fig. 3) shows that the maximum intensity of dyes on silk-acetate fabric when using various types of disperse dyes is achieved at a dyeing temperature of 45-550C.

These, the results of research carried out to improve and develop technology for obtaining binders and dyeing silk acetate fabrics colored with disperse dyes indicate the possibility of using mixed fabrics for dyeing.

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