DEVELOPMENT OF THE THICKENER COMPOSITION WITH LOCAL RAW-MATERIALS FOR PRINTING BLENDED FABRICS COTTON-SILK

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DEVELOPMENT OF THE THICKENER COMPOSITION WITH LOCAL RAW-MATERIALS FOR PRINTING BLENDED FABRICS COTTON-SILK

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Annotatsiya: Maqolada paxta-ipak toliagi matolarga gul bosish uchun karbosimetilkraxmal, uzxitan va gidrolizlangan akril emulsiya asosidagi yangi quyuqlovchli ishlab chiqildi. An’anaviy va yaratilgan quyuqlovchli bilan gulbosilgan matoning koloristik xossalari o’rganilgan.

Kalit so’zlар: xitozan, quyuqlovchli, paxta-ipak, emulsiya, kompozitsiya.

Аннотация: Разработан новый состав загустителя на основе карбоксиметилкрахмала, узхитана и гидролизованной акриловой эмульсии
печатания смесовой ткани хлопок - шелк. Изучены хлористические свойства набивных тканей с разработанным загустителем по сравнению традиционным загустителем.

**Ключевые слова:** хитозан, загустителя, хлопок - шелк, эмульсия, композиция.

**Abstract:** In the following article the developed new thickener are studied based on hydrolyzed acrylic emulsion (HAE), uzchitan and carbaxymethyl starch for printing mixed fabrics cotton-silk. Investigated coloristic prop-erty printed fabrics.

**Keywords:** uzchitan, thickener, cotton-silk, emulsion, composition.

**Introduction**

The need for printed fabrics is growing every year and now they occupy a large share of the manufactured fabrics market. In the foreign textile industry, the first place in the production of printed fabrics is occupied by materials from cellulose fibers, as well as blended fabrics based on natural fibers[1]. In this case, the main process of finishing is printing. Printing is a patterned coloring of fabrics, obtaining a pattern on it with one or more colorants. For printing of blended fabrics the colorants, that give the most durable and bright colors: active, pigments, dispersed and other colorants are used.

The production of printed textile materials increases every year. Such distribution determines the balance of consumption of colorants by class: pigments come to the first place, active colorants to the second, and disperse colorants to the third.

Currently, chitosan is used for dyeing and printing of cotton fabrics, and on the basis of cotton-silk, cotton-polyester, cotton-nitron, naturally mixed thickeners on the basis of natural and synthetic polymers can be used [2]. Existing experimental studies show that the search and development of new types of water-soluble mixed thickening agents for blended fabrics on the basis of carboxymethyl starch, with specially selected biopolymers [3], produced in Uzbekistan, is timely and relevant.

The purpose of this study was to develop cost-effective thickening compounds and assessment of the suitability of using printing inks on the basis of biodegradable...
polymers of Bombyx mori Uzkhanit, synthesized under the guidance of S.Sh. Rashidova [4-6] with the addition of acrylic emulsion produced by Navoiazot OJSC, as well as sodium salt of carboxymethyl starch for printing cotton-silk fabric (Table 1).

**Table 1**

<table>
<thead>
<tr>
<th>Ingredients, g/kg</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active dye</td>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>DGT</td>
<td>30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Carboxymethyl starch (CMS)</td>
<td>-</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Uzkhanit</td>
<td>-</td>
<td>*</td>
<td>20</td>
</tr>
<tr>
<td>*HAE (30%)</td>
<td>-</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Urea</td>
<td>150</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>Ludigol</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sodium sulphate</td>
<td>15</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Water</td>
<td>770</td>
<td>785</td>
<td>815</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Objects and methods of research. Methods for determining the degree of fixation of active dyes.

To determine the degree of fixation of the dyes, the Sokolov method was used, which based on the dissolution of the printed fabric in concentrated sulfuric acid, followed by dilution and colorimetry of the resulting hydrosols. A weighed portion of a printed tissue of 0.1-0.2 g., weighted with an accuracy of up to 0.0001 g., is crushed and placed in a glass beaker with a capacity of up to 50 ml. Then 15-20 ml of chemically pure concentrated sulfuric acid (p = 1.84 g / ml) are poured into a glass and dissolved upon cooling for 50-60 minutes. The resulting solution is poured into a measuring flask with a capacity of 250 ml, in which 100 ml 2% of solutionof the nonionic substance of OP-10 type are poured. The solution is cooled, adjusted to the mark with distilled water and is measured. The concentration of the dye on the fabric is calculated according to the calibration graph. The degree of fixation of active dyes
(DoF,%) is calculated by the formula:

\[
\text{DoF} = \frac{C_1}{C_2} \times 100;
\]

whereas: \(C_1\)- the concentration of the dye printed tissue after washing, \\(C_2\)- the concentration of the dye of the printed fabric before washing.

**Methodology for determining the intensity of printed fabrics.** The ICE International Colorimetric System provides the possibility of expressing color with three color coordinates or two chromaticity coordinates and lightness. The coordinates of the colors, as well as the coordinates of the chromaticity, are determined by calculation on the basis of the spectrophotometric characteristics of colored bodies or by using measuring instruments using the XYZ color graph. The color characteristics of the dyed fabrics were evaluated on a Minolta CM-3600d spectrophotometer (Japan) from Orintex, the calculations were performed on a computer using a special program.

**Results and Discussion**

It was of interest to study the regularity of alkaline hydrolysis of acrylic emulsion (AE) on the reaction conditions [7-8], since the acrylic emulsion is not a water-soluble polymer. Water solubility and high viscosity are the main requirements for thickeners.

Since hydroxyl-containing starch interacts with active dyes, we carried out the esterification of corn starch with sodium monochloroacetic acid salt (NaMCAA) (in the molar ratio 1:1.6) in an alkaline medium in the solid phase for 1 hour at a temperature of 35-45 °C to obtain carboxymethyl starch (CMS) [6]. Rheological and thixotropic properties of thickeners on the basis of CMS, Uzkhitan and synthetic polymers are studied in the work [9-10].

In November 2017, at the Bukhara-China joint enterprise "Bukhara Brilliant Silk-BBS", the production tests of the new thickeners, developed by the colleagues of the "General chemistry" department of TSTU and “Chemistry of the polymers” department of UzMU were carried out, for the purpose of printing of blended fabrics cotton-silk in the ratio 64:36. Thickeners are obtained with the use of local raw
material on the basis of the hydrolized acrylic emulsion (HAE), Uzkhitans and sodium salt of carboxymethyl starch (Na-CMS). The effect of thickeners on the intensity, washability (improvement of the surface) and the printing-technical properties of printed fabrics with active dyes were studied.

During the tests, the following procedure for preparing the thickener was observed: cold water of 30 liter volume is poured into the reactor and Uzkhitans: Na-CMS: HAE (mass ratio 2.0: 4.0: 1.0) is charged. To dissolve the dry thickener, continuous mixing for 30 minutes is performed, after which urea, sodium carbonate and sodium sulfate are added to the finished composite thickener. The resulting mass is pumped into the supply tank, and then the process is carried out according to the existing technology. The thickener obtained by the above method was used in printing cotton-silk fabric. Under the conditions of the enterprise, about 200 p.m of cotton-silk fabric was printed and the coloristic properties of printed fabrics were studied. Table 2

As can be seen from the table, 2, coloristic and printing-technical properties of cotton-silk printed fabrics are improved, and the fabric stiffness is decreased. The intensity of the printed pattern obtained by the use of composite thickener is higher than when using thickeners on the basis of imported DGT.

Table 2

<table>
<thead>
<tr>
<th>Components included in the thickener</th>
<th>Color hue, 1 home, Nm</th>
<th>The rigidity of the fabric, micron cm²</th>
<th>Color intensity, K / S</th>
<th>Unevenness of coloring, Average.max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alginate</td>
<td>488</td>
<td>8324</td>
<td>20.2</td>
<td>0.06 ¹</td>
</tr>
<tr>
<td>DGT</td>
<td>466</td>
<td>10150</td>
<td>16.8</td>
<td>0.18</td>
</tr>
<tr>
<td>Uzkhitans: Na-CMS: HAE</td>
<td>484</td>
<td>8450</td>
<td>19.8</td>
<td>0.09</td>
</tr>
</tbody>
</table>

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Further, the degree of fixation of various active dyes in comparison with the traditional thickener were studied (Table 3).

As can be seen from the table, developed mixed thickeners on the basis of CMS (carboxymethyl starch), Uzkhan and HAE, provide high intensity and dye degree of fixation.
The results of industrial approbation of printed blended fabrics led to the following conclusions.
The brightness of the printed pattern obtained using the proposed thickener exceeds the brightness of the printed pattern obtained using imported DGT thickener.

Printing with a new thickener for durability to wet treatments is not inferior to printing with imported DGT thickeners made in China.
The use of new thickener when printing on the flannel allows obtaining a softer surface of fabric and a high degree of fixation compared with samples printed with imported thickener.
The washability of the thickener when printing with the proposed thickener is higher than when printing with a running thickener.
During the tests no technical complications associated with the equipment and the preparation procedure for thickeners were figured out.

**Conclusion:**

Thus, a synthetic polymer (HAE) and Uzkhanit reduce the content of Na-CMS in printed compositions with an improvement in the quality of printing cotton-silk fabric. The printed-technical properties of the mixed thickeners of the CMS, HAE and Uzkhanit composition, show good results in comparison with imported DGT thickener. Composite mixed thickeners exhibit the greatest efficiency in terms of the degree of beneficial use of active dyes and coloristic indicators of dyes in steaming one-stage methods of printing cotton-silk fabric.
The work is carried out according to the applied project OT-A-12-11, which is part of the state scientific and technical program on the theme “Development of laboratory technology for the production of polymeric nanocomposite textile materials based on polyacrylates, chitosan and its derivatives”.

**Table 3**

**Printed-technical properties of printed fabrics**

<table>
<thead>
<tr>
<th>Thickener, dye</th>
<th>Degree of fixation</th>
<th>Intensity, K / S</th>
<th>The rigidity of the fabric, µN * cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed Uzkhitan-HAE-CMS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active red 6C</td>
<td>72.1</td>
<td>22.3</td>
<td>8450</td>
</tr>
<tr>
<td>Active orange 5K</td>
<td>68.8</td>
<td>21.4</td>
<td>9387</td>
</tr>
<tr>
<td>Bright blue CT</td>
<td>76.3</td>
<td>19.8</td>
<td>9450 &quot;1</td>
</tr>
<tr>
<td>Traditional, DGT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Active red 6C</td>
<td>62.7</td>
<td>18.5</td>
<td>8824</td>
</tr>
<tr>
<td>Active orange 5K</td>
<td>58.1</td>
<td>17.5</td>
<td>9780</td>
</tr>
<tr>
<td>Bright blue CT</td>
<td>64.0</td>
<td>16.8</td>
<td>10150</td>
</tr>
</tbody>
</table>
BIBLIOGRAPHY


