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Research of Production of Non-Woven Materials with A New Structure

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ABSTRACT: Methods have been developed for obtaining high-quality nonwoven materials based on components of secondary material resources and preparing fibers for mixing for the production of nonwoven materials. The change in the physical and mechanical properties of nonwoven fabrics is analyzed depending on the composition of secondary raw materials. With a comprehensive assessment of the quality characteristics of the nonwoven fabric, the area of the nonwoven fabric of option 1 in terms of physical and mechanical properties was 3373 mm², the area of the nonwoven fabric of option 2 in terms of physical and mechanical properties was 7045 mm², the area nonwoven fabric of 4 options for physical and mechanical properties was 3289 mm². The area of the nonwoven fabric of the 2nd variant turned out to be larger than the area of the polygons in terms of the quality characteristics of other nonwoven fabrics. Thus, the non-woven fabric produced according to option 2 turned out to be the most optimal option.

KEYWORDS: Speed, spindle, ring spinning machines, differential, elastic modulus.

I.INTRODUCTION

The production of innovative textiles is more efficient and plays an important role in the development of the country's economy. The competitiveness of textile products in modern conditions is ensured by a quick change of accessories and a low cost, as well as a custom-made custom Since the majority of nonwoven materials in Uzbekistan are made from cotton fibers and yarn, their specificity indicates the need for a deeper study of the properties and characteristics of fabrics, the introduction of its assessment into the system of international standards.

Improving the system of quality indicators is an urgent issue for an industry that is rapidly developing and improving.

The use of recycled textile raw materials in Uzbekistan, the needs and prospects for the use of nonwoven fabrics, the types of raw materials used in the production of nonwovens, methods of obtaining nonwovens have been investigated. Despite the implementation of various scientific works in this area, the issue of improving the methodology for assessing the quality of nonwoven fabrics, the production of nonwoven materials from various types of natural recycled materials and the assessment of their physical and mechanical properties remain relevant.

II. ANALYSIS OF EXISTING FILTERING MATERIALS AND RESEARCH RESULTS

The dissertation explores the improvement of the method of separating fibers from the bark of a mulberry tree and the use for the production of nonwoven fabrics, methods for determining the quality of secondary raw materials and nonwoven materials, evaluating test results according to the laws of mathematical statistics and the theory of probability.

In the study, the problem was solved when extracting bast fibers from the bark of mulberry tree branches, separating from lignin and pentosans with a minimum effect on cellulose in the fiber. Pentosan and lignin are substances that bind bast fibers together, giving them the properties of rigidity. Lignin and pentosan do not dissolve in water. Therefore, with prolonged soaking, destruction due to fermentation is observed. In the course of the study, the method of extracting bast fibers was improved by the separation of lignin and pentozones under the action of enzymes. It was found that the implementation of soaking and boiling by a chemical method, i.e. with the use of ammonium sulfate is preferred due to the high speed and quality of the process. Therefore, it is advisable to use these saline

It was found that the implementation of soaking and boiling by a chemical method, i.e. with the use of ammonium sulfate is preferred due to the high speed and quality of the process. Therefore, it is advisable to use these saline solutions, starting with the separation of the bark from the stem. To separate the bark from the wood, 1.5% ammonium sulfate salt was used for 14 days.

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III. EXPERIMENTAL RESULTS

When evaluating the chemical composition of the fiber boiled under different conditions, the amount of hemicellulose, cellulose, and lignin was determined. The results obtained showed that the proposed method, when cooking bast fibers of a mulberry tree in ammonium sulfate, loses only pentazane and lignin, and the cellulose part is well preserved.

The sequence of separation of fibers from a branch of a mulberry tree



Taking into account the growing demand for nonwovens and to ensure the expansion of the range of nonwoven fabrics, it was planned to use waste of natural cotton fibers, silk spinning, and mulberry fiber.

The composition of the mixture for the production of nonwovens is selected from the depleted resources of recycled materials. In the course of the research, the mixture was formed in four different variants: 1. Cotton spinning-100%, 2. Cotton spinning-50%, silk-spinning strips - 30%, mulberry fibers - 20%, 3. Cotton spinning-70%, silk spinning hair - 15%, mulberry fiber - 15%, 4. Cotton spinning hair - 75%, silk spinning hair - 10%, mulberry fiber - 15%.

Raw materials produced from various material resources were subjected to the processes of mixing, carding and cleaning from impurities. The resulting mixture of different composition was cleaned from impurities in a cleaning machine. From the previously cleaned fibrous mixture with the help of a scrim-forming unit, a fibrous mat of a predetermined thickness is formed, which is additionally cleaned of dust.

Nonwoven fabrics were made from a fibrous layer formed in the AChV-3 unit by the knitting and stitching method.

Correlation coefficients and errors of changes in the physical and mechanical properties of fibers isolated from the bark of a mulberry tree, the influence of the composition of secondary raw materials on the technological parameters of nonwoven fabrics, changes in the physical and mechanical properties of nonwoven fabrics, abrasion resistance and shrinkage changes, changes in deformation characteristics during single-cycle elongation of nonwoven fabrics have been determined. of canvases, a comprehensive assessment of quality indicators was carried out.

| | | Thread length | Linear density of | Areal density of | Bulk density of |
|----|-------------------|----------------------|-------------------|--------------------|-----------------|
| N⁰ | Nonwovens options | per 1 m ² | nonwovens, | nonwovens | nonwovens, |
| | | material, m | g / m | g / m ² | mg / mm^3 |
| 1. | Option 1 | 202 | 28,6 | 141,3 | 0,20 |
| 2. | Option 2 | 203 | 23,6 | 118,2 | 0,19 |
| 3. | Option 3 | 206 | 28,9 | 143,2 | 0,20 |
| 4. | Option 4 | 205 | 35,6 | 176,2 | 0,18 |

 Table 1

 Changes in the technological characteristics of nonwoven fabrics

The results of the study show that the length of the yarn per 1 m2 of nonwoven fabric made from different compositions increased from 0.5% to 1.9%, the linear density decreased to 21.1%, the surface density decreased to 19.5%, and the bulk density decreased from 5.0% to 10.0%.

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Tests were carried out to study the mechanical properties of nonwovens. The research results are presented in table 2.

Table 2 Changes in the mechanical properties of nonwoven fabrics depending on the composition of secondary raw materials

| N⁰ | Nonwovens options | Areal density of nonwoven fabric | Breaking load of nonwoven fabric,H | | Breaking elongation of nonwoven fabric,% | | Coefficient of variation for |
|----|-------------------|----------------------------------|---------------------------------------|----------|--|----------|---------------------------------|
| | | g/m ² | by lenght | in width | по длине | in width | breaking load of |
| | | | | | | | nonwoven fabric,% |
| 1. | Option 1 | 131,9 | 60,0 | 150 | 30 | 48 | 14,0 |
| 2. | Option 2 | 148,7 | 68,1 | 165 | 27 | 42 | 7,8 |
| 3. | Option 3 | 118,7 | 68,1 | 150 | 27 | 36 | 8,34 |
| 4. | Option 4 | 174,6 | 52,1 | 142 | 30 | 41 | 5,79 |

According to the results of the study, it was determined that the quality characteristics of the nonwoven fabric produced according to option 2, in comparison with other options, improved, namely: the strength reading increased by 34.5%, the elongation at break by 10.0%, the coefficient of variation of the nonwoven fabric in terms of areal density by 27.7%, the coefficient of variation in breaking load by 44.2% decreased in comparison with other options. The physical properties of nonwovens include such indicators as hygroscopicity, air and vapor permeability, dust absorption, electrification, optical and heat-shielding properties.



Rice. 1. Changes in the air and thermal conductivity of nonwoven fabrics





Rice. 2. Changes in the coefficient of variation of nonwoven fabrics depending on air permeability

The electrical properties of nonwoven materials with different composition of secondary raw materials were investigated and the graphs shown in Fig. 3 were constructed based on the test results.



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According to the test results, it can be seen that, depending on the composition of the fibrous waste during the production of nonwoven fabric, the air permeability index of the fabric increased from 20.9% to 49.4%, thermal conductivity - from 13.5% to 29.1%, the coefficient of variation in terms of air permeability decreased from 6.6% to 16.8%.



Rice. 3. Changing the electrical properties of nonwoven fabrics

According to the test results, it can be seen that the electrification of the nonwoven fabric produced according to the 3rd option, with self-abrasion and the electrification of the nonwoven fabric produced according to the 1st option, on the synthetic fabric, decreased, in contrast to other versions of nonwoven fabrics.

 Table 3

 Changes in abrasion and shrinkage resistance of nonwoven fabrics

| | | Composition of secondary raw materials in nonwoven fabrics | | | | |
|----|--------------------------------------|--|----------|----------|----------|--|
| № | Indicators | Option 1 | Option 2 | Option 3 | Option 3 | |
| | Shrinkage,% | | | | | |
| | по длине | +3,5 | +4,5 | +5,5 | +6,0 | |
| 1. | dispersion, σ | 2,2 | 0,97 | 5,1 | 5,17 | |
| | the coefficient of variation, $C \%$ | 1,13 | 0,51 | 2,69 | 2,75 | |
| 2. | in width | -5,0 | -3,0 | -6,5 | -7,0 | |
| | $_{ m dispersion,}\sigma$ | 10,3 | 4,53 | 4,53 | 5,31 | |
| | The coefficient of variation, C % | 4,90 | 2,19 | 2,12 | 2,48 | |
| 3. | Wear resistance | 3300 | 5750 | 3000 | 5545 | |

The test results obtained in determining the physical and mechanical properties of nonwoven materials with different quantitative content of secondary raw materials were compared in accordance with Fisher's and Student's criteria. Strength and breathability were taken as the main parameters.

To determine the significance of the difference between the two mean variances at the confidence level, the quotient of the variance estimates for the general population is taken. The differences in the results for the variants of the produced nonwoven webs turned out to be unequal, therefore, there was a sharp difference in dispersion, and, on average, it is recommended to implement the most optimal option for comparing the quality indicators of nonwoven webs through a comprehensive assessment based on the graph. Studies have been conducted to determine the abrasion and shrinkage resistance of nonwovens. The test results are presented in table 3.

From the analysis of the test results, it was found that the nonwoven fabric produced according to option 2 has high wear resistance and low shrinkage rates in length and width. Changes in indicators of elastic, elastic and plastic

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elongation of nonwoven materials were studied depending on the composition of secondary raw materials and the test results obtained are presented in table 4.

Table 4

Influence of the mixed composition of secondary raw materials of nonwoven fabrics on changes in characteristics during single-cycle tensile deformation.

| | Nonwoven options | Full deformation,% | Components of full deformation | | |
|--|------------------|-----------------------|--------------------------------|---------|---------|
| | | | elastic | elastic | plastic |
| | Option 1 | 8,0 | 0,33 | 0,33 | 0,33 |
| | Option 2 | 6,0 | 0,57 | 0,33 | 0,10 |
| | Option 3 | 6,0 | 0,50 | 0,35 | 0,15 |
| | Option 4 | 6,0 | 0,50 | 0,38 | 0,12 |

According to the test results, it can be seen that in the nonwoven fabric of the 1-variant, in comparison with other versions of non-woven fabrics, the value of elastic deformation decreased and, accordingly, the value of plastic (permanent) deformation in the composition of the complete one increased. In addition, in comparison with the nonwoven fabric produced by option 1, the total deformation of the nonwoven fabric obtained by option 2 decreased by 25.0%, the content of elastic deformation increased by 42.0%, the content of plastic (residual) deformation decreased by 70,0%.

The results obtained under single-cycle tensile deformation of nonwoven fabrics were compared according to the criteria.

The analysis of the results when calculating the Student's criterion for comparing the two variants of nonwoven fabrics in terms of the unevenness of elastic deformation during stretching showed that when comparing the characteristics of the nonwoven fabric produced according to option 1 with the characteristics of the nonwoven fabric of option 2, the deviation of the values for the arithmetic mean is 31.10, by standard deviation 0.38, coefficient of variation 344.3; when comparing the nonwoven fabric 3,deviation of values for arithmetic mean indicators is 8.4, for standard deviation 2.0, for coefficient of variation 440.68; when comparing the characteristics of the nonwoven fabric produced according to option 2 with the characteristics of the nonwoven fabric produced according to option 2, the standard deviation is 0.89, and the coefficient of variation is 221.8.

The unevenness pattern of the nonwoven webs was analyzed using a thickness chart and their functions.

A comprehensive assessment of the quality indicators of nonwoven fabrics has been carried out. A comprehensive assessment was carried out on the basis of the breaking load of nonwoven fabrics with different fiber content, elongation at break in length and width, surface density, coefficient of variation for breaking load.

After a comprehensive assessment of the test results obtained in determining the physical and mechanical properties of nonwoven fabrics with different composition of secondary raw materials, their areas were determined and the results are presented in Fig. 4 as a histogram.

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Fig. 4. Comparative histogram of quality indicators of nonwoven fabrics

The comparative histogram of the quality indicators of nonwoven fabrics shows that the area of the nonwoven fabric obtained according to the first option is 3373 mm² in terms of physical and mechanical properties, the area of the nonwoven fabric obtained according to the second option in terms of physical and mechanical properties is 7045 mm², for the nonwoven fabric obtained according to Option 3. the surface area in terms of physical and mechanical properties was 6797 mm², the area of the nonwoven fabric obtained according to Option 3. the surface area in terms of physical and mechanical properties was 6797 mm², the area of the nonwoven fabric obtained according to the 2nd variant turned out to be larger than the area of the polygons in terms of the quality characteristics of other nonwoven fabrics. Thus, the non-woven fabric produced according to option 2 turned out to be the most optimal option.

IV. CONCLUSION AND FUTURE WORK

1. A technology has been developed for obtaining fiber from the bark of a mulberry tree. Methods have been developed for obtaining high-quality nonwoven materials based on components of secondary material resources and preparing fibers for mixing for the production of nonwoven materials. The quality of secondary raw materials and nonwovens was determined on the basis of state standards and non-standard methods, and the physical and mechanical properties were compared according to the criteria.

2. Analyzed the change in the physical and mechanical properties of nonwoven fabrics depending on the composition of secondary raw materials. According to the test results, the surface density of the nonwoven fabric obtained by option 2 increased by 11.3%, the breaking load along the length increased by 11.8%, the breaking load along the width increased by 9.1%, the elongation increased by 10.0%. the coefficient of variation in the surface density of the nonwoven fabric decreased by 27.7%, the coefficient of variation in the strength of the nonwoven fabric decreased by 44.2%, the air permeability of the nonwoven fabric obtained by option 1, and the heat retention of the nonwoven fabric produced by option 2 turned out to be better than other canvases.

3. With a comprehensive assessment of the quality characteristics of nonwoven fabric, the area of nonwoven fabric of option 1 in terms of physical and mechanical properties was 3373 mm2, area of nonwoven fabric of option 2 in terms of physical and mechanical properties was 7045 mm2, area of nonwoven fabric of option 3 in terms of physical and mechanical properties was 6797 mm2, the area of the nonwoven fabric of the 4th variant in terms of physical and mechanical properties was 3289 mm2. Hence it follows that the area of the nonwoven fabric of the 2nd variant turned out to be larger than the area of the polygons in terms of the quality characteristics of other nonwoven fabrics. Thus, the non-woven fabric produced according to option 2 turned out to be the most optimal option.

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REFERENCES

- 1. Patxullaev S.U., Islambekova N.M. Research of properties of mulberry tree bark lub fibers // Scientific-technical and practical journal of Composite Materials -2019, -№1 -B. 100-103. (05.00.00; №13)
- Patxullayev S.U., Ochilov T. A., Kulmetov M., Akhmedov B., Saidmuratova S. S., Yusupov A.Z. Influence of Degree of Maturity on theQualitative Indicators of Cotton Fiber// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2019, -Vol. 6- Issue 5-N. 9175-9179. (05.00.00; №8)
- 3. Patxullayev S.U., Ochilov T. A., Valieva Z.F., Laysheva E.T., Yusupov A.Z. Change of Fiber Length and QualitativeCharacteristics of Yarns Depending on theMaturity of Cotton// J. "IJARSET" International Journal of AdvancedResearch in Science,Engineering and Technology -2019, -Vol. 6- Issue 5-N. 9209-9211. (05.00.00; №8)
- Patxullayev S.U., Islambekova N.M., Azamatov U.N., Khaydarov S.S. Study of the Properties of Fibers ObtainedFrom Mulberry Fiber// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2019, -Vol. 6- Issue 5-N. 9239-9242. (05.00.00; №8)
- Patxullayev S.U., Ochilov T. A., Valieva Z.F., Usmonova Sh.A., Atanafasov M. Influence of Fiber Maturity Degree onPhysical and Mechanical Properties of Yarn// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2019, -Vol. 6- Issue 5-N. 9259-9262. (05.00.00; №8)
- 6. Patxullaev S.U. Comparison of physical and mechanical properties of fiber from mulberry bark with natural fibers // Journal of Textile Problems. - 2020 - №1. -B. 57-62. (05.00.00; №17)
- Patxullayev S.U., Ochilov T. A., Abdugaffarov A.A., Ubaydullayeva D.X., Valieva Z.F., Taniberdiyev F.R. Change of Qualitative characteristics of FibersProduced from the Tark Mulberry TreeBranches// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2020, -Vol. 7- Issue 1 -N. 12632-12635. (05.00.00; №8)
- Patxullayev S.U., Islambekova N.M., Khaydarov S.S. Improvement of the Method for Unloading Cocoons// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2020, -Vol. 7-Issue 2 -N. 12951-12956. (05.00.00; №8)
- Patxullayev S.U., Ochilov T. A., Muxtarov J.R., Atanafasov M.R., Orozbayeva R.I. Changes in Ergonomic Properties of Non-Woven Fabrics// J. "IJARSET" International Journal of AdvancedResearch in Science, Engineering and Technology -2020, -Vol. 7- Issue 5 -N. 13691-13694. (05.00.00; №8)
- 10. Patxullayev S.U.,Kulmetov M., Ochilov T.A., Orozbayeva R.I., Mingnorov Sh. Comprehensive Evaluation of Ergonomic Properties of Non-Woven Fabrics// J. "IJARSET" International Journal of AdvancedResearch in Science,Engineering and Technology -2020, -Vol. 7— Issue 5 -N. 13759-13761. (05.00.00; №8)





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