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Investigation of substrate properties of non-woven polyester textiles using nano-urea

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ABSTRACT

Due to the development of nanotechnology and its expansion in industries such as textiles, agriculture, etc., and considering that nanotechnology increases the speed of reactions and reduces the consumption of chemicals and improves environmental conditions, so in this study nano urea synthesis methods in polyester substrate and preparation methods and properties created in this textile were used as other textiles and geotextiles. In this study, in order to synthesize nano-urea, we first ground samples of urea with the help of a mill and impregnated it on a polyester textile bed. The results show that increasing the concentration and grinding time is effective in the solution removal Increasing the concentration of the solution and increasing the grinding time of the samples have a positive effect on the urea uptake by the product and there is a significant difference between the samples and the dimensional parameters are done using the mill and examined at different times. Prepared with concentrations of 1500-500 ppm and applied it under different conditions on non-woven polyester fabric by pad-dry-cure method and dried at room temperature. Finally, additional FTIR-UV-AA tests and flexural strength tests were performed on the samples. UV and AA tests also show that by reducing the size and concentration of urea, the amount of urea absorbed by the fabric increases and as an agar textile causes urea to remain in the soil longer and tolerate the time of uptake by the plant. Bending of the sample, increasing the concentration in the samples indicates that the thickness of the synthesized urea has increased and due to the amorphous structure of the film, it has increased the flexibility, which is different in the length and width of the fabric, which indicates structural changes. The fabric is nonwoven. The results of FT-IR test of the samples show that the functional groups of the polyester spectrum are somewhat displaced in the presence of urea. Which indicates the binding of NH_2 urea groups with polyester fiber, which indicates the reaction between them, and the strength test shows that to the point of rupture and elongation, it was found that increasing the concentration of urea in the process greatly increases the elasticity. And increases the length to the point of rupture to the extent that it shows an improvement of 6-8%, but reduces the tensile strength due to the formation of a fiber bond Conclusion: Non-woven polyester textile sample with nano urea synthesis by comparing the absorption wavelength of urea in different concentrations on the non-woven polyester substrate indicates that it leads to a change in the absorption wavelength and urea is placed in the fiber bed and

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decreases the concentration. The wavelength is closer to the nano range and due to the amorphous structure of the film, it has increased the flexibility, which is different in the length and width of the fabric, which is a sign of structural changes in the nonwovens.

Keywords: Polyester non-woven fabric, nano urea, optimization, fibers

1. INTRODUCTION

It is a type of fabric that is produced without weaving in such a way that the fibers are interwoven and bonding operations are performed on them to create a substrate or the same as textile. There is no warp or weft in this industry. This bonding and entanglement of fibers is done by pressure, heat, shock or chemicals, each of which produces a product with different properties. The non-woven textile industry is developing and expanding day by day, now 30% of the world's non-woven textiles are increasing day by day. The most common type of these textiles is felt. Masks, pads, isogum, various types of insulation, wallpaper, etc. are types of non-woven textiles. Non-woven textiles (non-woven) are textiles that are made directly from separate fibers.In this way, the fibers are placed together in different ways and are connected to each other by different means such as needle and heat or by using glue or binder and produce a complete surface in the form of fabric. Non-woven textiles are widely used in civil engineering and medical projects today. Today, they are used as blood purifiers in artificial kidney and heart devices, as well as as advanced dressings. Nonwoven fabrics, scientifically known as nonwoven fabrics, are widely used today and the number of products in this industry is increasing daily. The most important application of this industry is in healthcare, which includes hospital clothes, pads, surgical sets, wound adhesives, bandages and gauze, and so on. Non-woven fabrics, carpets, paper, paper towels, all kinds of wall coverings and insulations such as isogum, spunbond fabrics, sanitary pads, diaper absorber and so on. Other products of non-woven industry are considered. Non-woven textiles have unique uses in almost all industries and guilds. Among the most consumed industries are advertising and packaging industry, agriculture, health and beauty, road construction and construction industry. For example, today, cloth handbags are one of the largest consumers of spunbond fabrics after the hospital clothing industry. Production with high volume and speed, very low price, easy recycling and a wide range of products that can be produced with these textiles are the reasons for the growing popularity of this human invention. Polyester can also be used to produce non-woven textiles. Non-woven textiles made of polyester fibers, despite their high price, have practical advantages over non-woven polypropylene non-woven textiles. He used polyester waste to produce non-woven textiles. Tensile strength, initial model and thermal stability of non-woven polyester textiles are much higher than non-woven textiles made of polypropylene. In addition to the mentioned advantages, non-woven polyester textiles can be easily dyed or printed in common processes. [1-3].Since in this industry the formation of textiles is done without the use of spun yarns and is not a function of conventional weaving systems on weaving machines (in the form of weft), according to the methods of layer formation and bonding of fibers are divided into the following groups: The process of layer formation is: wetting,

drying, aeration. Non-woven textiles are formed in several ways. In this research, the hydrodynamic method (entanglement by water) which is spanless has been used. In terms of forming the primary layer, Spanless non-woven textiles are from the group of drying system, which is done by carding machines. Until 2005, about 90% of all non-woven textiles in the world were produced in this way. In terms of connecting and breaking the fibers, it is done mechanically. The mechanical method is mainly divided into two categories. There are other methods in mechanical connection because it has no major application and is not mentioned. The advantages of Spanless that can be mentioned: · Ability to absorb high moisture, softness and flexibility, no use of foreign or chemical materials, high tensile strength in both longitudinal and transverse directions and the use of a wide range of products.[4-6]. In this research, by using nano-urea, it has caused uniform coating of polyester fabric with nanoparticles and prevented the accumulation of nanoparticles on the surface and has improved its properties. Production of special fibers (natural and synthetic fibers), fine fibers, two or more component fibers, and production of special nonwoven textiles, these properties will increase the added value of polyester fabric; However, the use of these materials has not significantly reduced the strength of the fiber. Samples of urea impregnated in polyester fabric sample The results show that increasing the concentration and grinding time of the solution was effective in increasing the concentration of the solution and increasing the grinding time of the samples had a positive effect on urea uptake by the product. And there is a significant difference between the samples. One of the basic features due to its very good miscibility as an additive is their applicability in the production of special textiles.[7-13].

2. EXPERIMENTS

2.1. Materials and methods

In this study, nonwoven polyester fabric and urea synthesis were prepared and the experiments were reported as the first ancestor. After preparing non-woven polyester fabric, perform textile tests on the following devices such as Abrasion stability test, Bending test, FTIR test, Tensile strength test and UV test was measured.

2.2. Synthesis of urea samples and preparation of nonwovens

First, some urea was ground at different times and considered for 10-30 minutes, and then with 40 ° water, 15% and 10%, 5%, 1% solutions were prepared at pH = 7-7.5.

Prepare polyester textile samples prepared in10*10[dimensions with 2 (g/l) detergent 1 g / l at 70 ° C and after drying, weigh and for 15 minutes in concentrated urea solutions. And put at different times and after hydro extraction in the oven at 70 ° C to dry, then weigh the sample again and the results are given in the table below [14].

2.2.1. Method of preparation of solutions

To prepare the sample, solutions with different concentrations of 500-500 ppm with ground urea powders prepared in the above section were examined.

2.2.1. 1. Preparation of solution number (1)

In the same way, we dissolve 1 gram of ground urea for 10 minutes in 99 cc of distilled water, which led to the production of 1% solution (10) (solution number 1).

Table 1: Results and conditions of preparation and weight changes of samples in different percentages of solutions from 1% to 15%

Sample Number	Sample type	Initial weight (g)	Secondary weight (g)
Solution 1%	Urea 10%-Sample 1	2.42	2.45
	Urea 20%-Sample 2	2.12	2.14
	Urea 30%-Sample 3	2.18	2.20
Solution 5%	Urea 10%-Sample 1	2.31	2.53
	Urea 20%-Sample 2	2.53	2.92
	Urea 30%-Sample 3	2.73	2.44
Solution 10%	Urea 10%-Sample 1	2.40	3.00
	Urea 20%-Sample 2	2.50	2.78
	Urea 30%-Sample 3	2.43	2.87
Solution 15%	Urea 10%-Sample 1	2.40	5.08
	Urea 20%-Sample 2	3.42	2.35
	Urea 30%-Sample 3	3.01	2.33

2.2.1.2. Prepare solution number (2)

Then remove 1% cc from the obtained solution and cholera Dissolve 99 cc of distilled water (solution number 2) and prepare.

2.2.1.3. Preparation of solution number (3)

To prepare solution number (3) and again from solution number 2, take 5 cc and mix it with 95 cc of distilled water (solution 3), which is a solution (solution 3) with a concentration of 500 ppm.

2.2.1.4. Preparation of ppm solution number (4)

Take 1000 cc of the above solution and mix with 90 cc of distilled water to obtain a solution of 1000 ppm.

- Preparation of solution: 1500 ppm from 1000 ppm solution, take 15cc and mix with 85 cc of distilled water to get 1500 ppm solution
- Preparation of 2000 ppm solution: Take 20 cc of 1500 ppm solution and mix with 80 cc of distilled water to obtain 2000 ppm solution.

3. DISCUSSION AND CONCLUSION

3.1. steps of optimizing the production of non-woven fabric samples

After performing the steps mentioned in the fourth paragraph, a solution was prepared from 2000-500 ppm, from each of these solutions, 50 cc was taken and placed in 4 closed containers, and then 4 polyester samples 10 x 10 were separately placed in the solutions. Put 2000-500 ppm for 30 'and after removing the samples from the solution, dry them. The product was soaked in 4 dried samples in solutions of 2000-2000 ppm for 30' and with the results of the fourth sample. Selected as optimal. All the mentioned steps were repeated on mixed 20 'and 30' ureas, the results of which are shown in Table (2) 12 samples of 10 × 10 polyester layers with different concentrations from the effluent sample. It can be seen in Table of (2) to (12) samples of 10 * 10 polyester layers with different concentrations of mixed effluent from 30´ -10´ of the effluent sample) were prepared.

3.2. Characterization of Synthesized polyester textiles with nano-urea

Characteristics of polyester textiles with nano-urea after coating operations of samples, according to the desired national and international standards, various textile tests such as: abrasion, flexural and tensile strength and FTIR and then UV absorption spectrophotometry test the effluent sample was taken.

Table 2. Samples of 10 x 10 polyester layers with different concentrations of mixed effluent

Sample	Concentration (ppm)	Explanation
sample mixed with urea 10 in concentrations of 500-2000ppm	500ppm	sample 10 x 10 layers polyester + 40cc waste \
	1000ppm	sample 10 x 10 layers polyester + 40cc waste \
	1500ppm	sample 10 x 10 layers polyester + 40cc waste \
	2000 ppm	sample 10 x 10 layers polyester + 40cc waste \
sample mixed with 20' urea in concentrations of 500-2000ppm	500ppm	sample 10 x 10 layers polyester + 40cc waste \
	1000ppm	sample 10 x 10 layers polyester + 40cc waste \
	1500ppm	sample 10 x 10 layers polyester + 40cc waste \
	2000 ppm	sample 10 x 10 layers polyester + 40cc waste \
The solution sample mixed with 30' urea in concentrations of 500-2000ppm	500ppm	sample 10 x 10 layers polyester + 40cc waste \
	1000ppm	sample 10 x 10 layers polyester + 40cc waste \
	1500ppm	sample 10 x 10 layers polyester + 40cc waste \
	2000 ppm	sample 10 x 10 layers polyester + 40cc waste \

3.2. 1. Abrasion test

After preparing the samples, the abrasion test was performed by a Martitendel machine (abrasion machine). It is necessary to explain that the samples were randomly cut from different parts of the sample in a circle with a diameter of 4 cm. Before mounting the samples on the abrasive machine, the thickness of the samples is measured by the thickness gauge and the average thicknesses are recorded. Then it is weighed and the initial weight is recorded. Secondary weight) is noted. Also, 4 control samples were prepared and shown in Table (3) and this device has 4 circular molds with a diameter of 4 cm that the samples are mounted on these molds for wear and on these molds weights called compactors. There are weights called A, B, and C, respectively.

The sum of these 3 weights enters a force of about 200gf / cm2. Before starting the device, the number of cycles we are considering in terms of (rpm) is entered into the device, which is not limited and the number of cycles can be different depending on the test. The results of abrasion tests of solutions with different percentages in Tables (4-7) indicate that the samples after three rounds have resulted in partial or constant weight loss in the sample.

3.2.2. Bending measurement

The fabrics are not completely soft and they are not hard. The flexural stiffness of the fabric can have a significant effect on many properties related to the comfort of the fabric, including the undercoat, a feature that plays an important role in the optimal use of the fabric in its application. Bending length, as an indicator of flexural stiffness, is the length of the fabric that bends at a certain angle due to its weight, and therefore the greater the bending length indicates that the fabric is flat. The ester was cut to the dimensions of 2.5 x 20 and placed one by one on the bending tester. The amount of bending in length scale in cm was measured in two directions after bending by a ruler [15, 16]. The results show that the length of the samples is proportional. It has been reduced to primary and can be seen in Tables (8-11).

Table 3. Types of samples used in experiments

Blank sample	Initial weight (g)
Sample 1	0.340
Sample 2	0.315
Sample 3	0.298
Sample 4	0.330

Table 4. Four control samples along with the results of its tests

Sample	Sample number	Initial weight (g)	500 first round	500 second round	500, third round
Solution 1%	S=1	0.312	0.312	0.311	0.310
	S=2	0.317	0.316	0.315	0.315
	S=3	0.302	0.301	0.301	0.301
	S=4	0.317	0.316	0.315	0.314
Solution 2%	S=1	0.319	0.318	0.318	0.317
	S=2	0.306	0.306	0.306	0.305
	S=3	0.360	0.359	0.359	0.358
	S=4	0.346	0.346	0.345	0.344
Solution 3%	S=1	0.402	0.399	0.397	0.397
	S=2	0.386	0.385	0.384	0.383
	S=3	0.450	0.440	0.335	0.33
	S=4	0.360	0.358	0.353	0.351
Solution 4%	S=1	0.364	0.357	0.357	0.357
	S=2	0.381	0.375	0.375	0.373
	S=3	0.340	0.340	0.337	0.336
	S=4	0.392	0.389	0.388	0.385

3.2.3. FTIR spectroscopy

The results of FTIR test on the control sample are samples before and after nano-urea pad and the sample whose optimization is done with the help of a combination of four solutions is presented in Figure (1,2). As can be seen in the figures, specific peaks are provided for all samples. In addition, the peak of all spectra was performed before nano-urea and after the addition of nano-urea on the compared polyester fabric. 3000-2700 is related to the tensile vibration of C-H. The peak in the range of cm-1 is 1550-1650 and 1300-1000 is related to the amine N-H and esterification of C-O, respectively. In the range of 2400 to 1800 cm-1, tensile bonds are C = C and in cm-1, 900-1400 cm, the tensile vibrations of C-C, C-O and C-H and the bending vibrations of CH are related to the chemical structure of urea and polyester the range of 2400 to 1800 cm-1, tensile bonds are C = C and in cm-1, 900-1400 cm, the tensile vibrations of C-C, C-O and C-H and the bending vibrations of CH are related to the chemical structure of urea and polyester. [17-21] Thus, during the optimization process, a new hydroxyl and amide bond is formed.

3.2.4. Tensile test

Tensile test is one of the destructive tests in which the sample is subjected to one-dimensional tensile force to the point of failure, while the elongation is also recorded simultaneously with the applied force. The test results are usually used to select a material for quality control. And predict how a substance reacts under other types of forces. The engineering strain stress curve is plotted based on the values of the elongation force, so the test output is a strain stress curve that indicates the behavior of the material under tension [16]. The data obtained in this test are used to determine the mechanical properties of

the material, and the following quantities are obtained and Figure (3) shows the tensile strength of nano-urea. Indicates tensile strength and according to the results of the strength test and the numbers obtained from the strength to the rupture and elongation to the rupture of the samples, it is clear that increasing the concentration of urea in the process greatly increases the elasticity and elongation to the limit. Increases tear in a way that shows a 6-8% improvement, but reduces tensile strength due to fiber bonding [21-23].

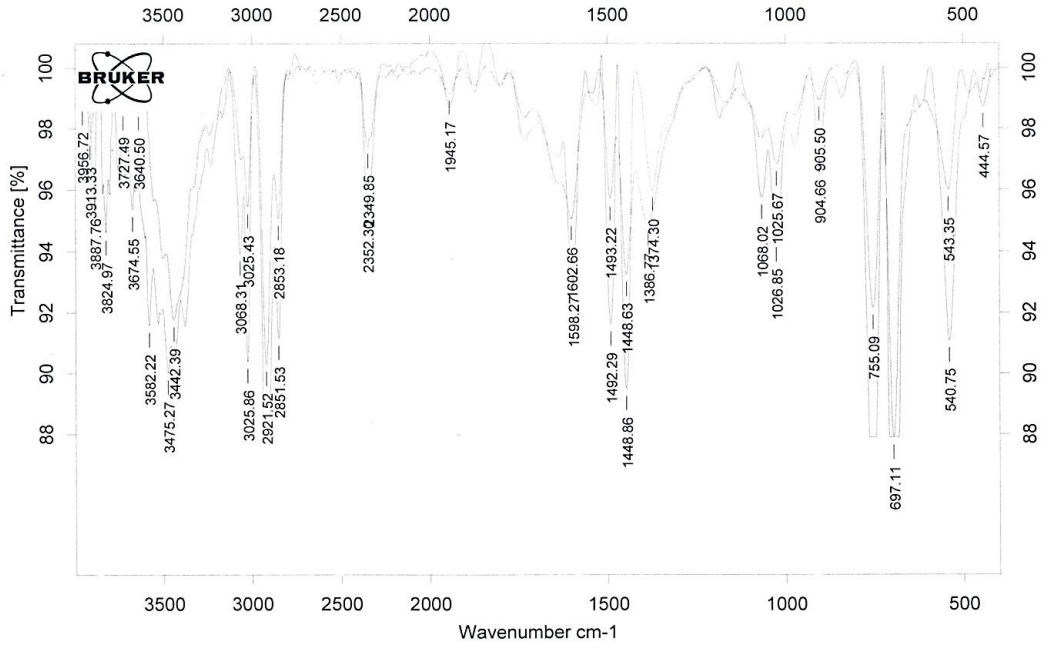

Figure (1): The FTIR spectrum shows the polyester before the addition of nano-urea

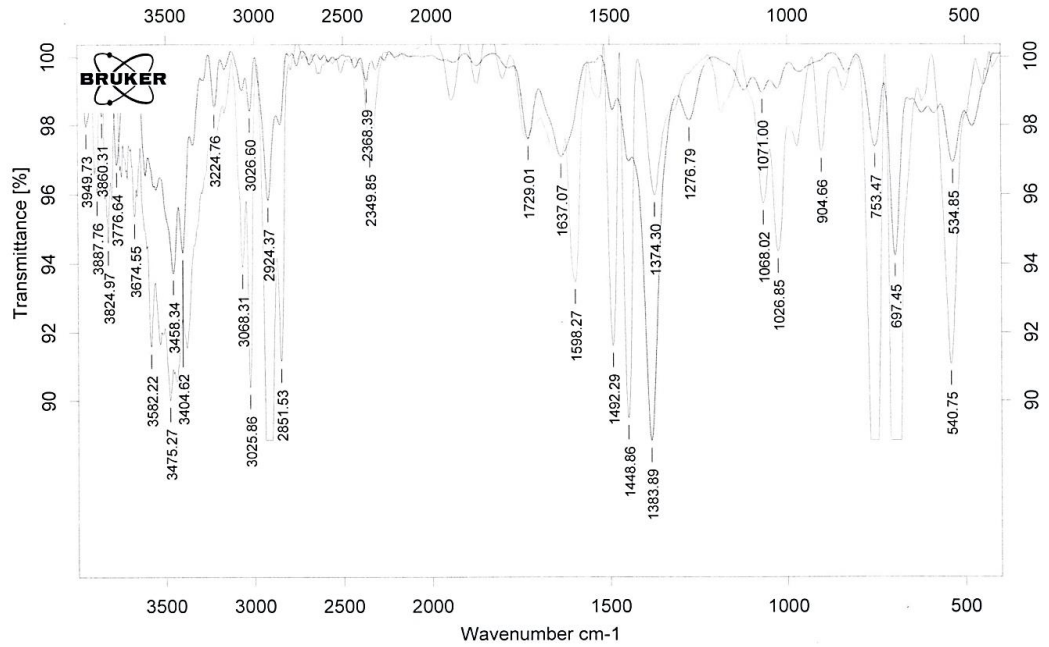

Figure (2): The FTIR spectrum shows a polyester fabric with the addition Tensile strength test

3.2.5. Absorption spectrophotometric test

Spectrophotometers are devices that determine the absorption or passage of specific wavelengths of radiant energy (light) from an analyte in a solution, due to differences in the number and arrangement of groups, double bonds of carbon atoms per molecule, light Absorbs at specific wavelengths with a specific spectrum pattern. According to Beer Lambert Fanon, the amount of light absorbed from this specific wavelength is directly proportional to the concentration of the chemical sample. Visible and ultraviolet spectrophotometers and it should be noted that using the infrared device and the maximum wavelength of the sample It is below 360 nm. Different concentrations were prepared from the sample and its adsorption is observed. The table (12) shows the absorption spectrophotometer results and the shape of the absorption curve (4) relative to the different concentrations of the sample. Adsorption was plotted at different concentrations. By comparing the absorption wavelength of urea in different concentrations and changing the absorption wavelength, the results show that urea is placed in the fiber bed and the decrease in concentration causes the wavelength to approach the nano range.

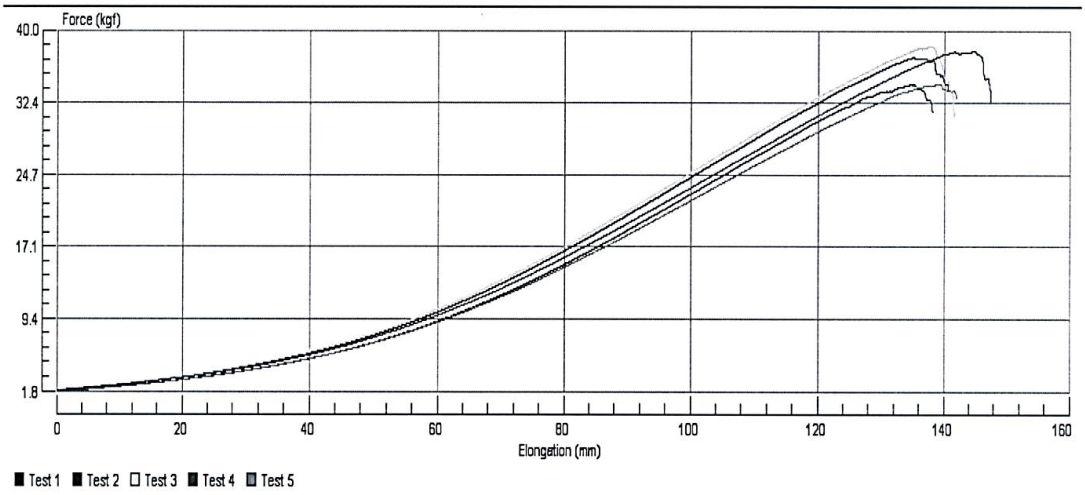

Figure (3): shows the tensile strength

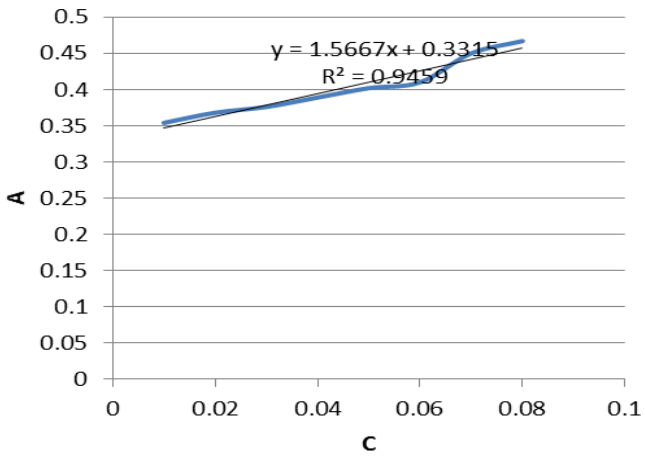

Figure (4) shows the absorption curve with respect to different concentrations of the sample.

4. CONCLUSION

In this study, in order to synthesize nano-urea, we first ground samples of urea with the help of a mill and impregnated them with goods. Increasing the milling time of the samples has a positive effect on the urea uptake by the product and there is a significant difference between the samples. By examining the bending test of the sample and the obtained results, increasing the concentration in the samples up to sample number 3 decreased the bending length and bending length, but in sample 4 it increased again, indicating that the thickness of synthesized urea increased due to amorphous The structure of the created film increases the flexibility, which varies in the length and width of the fabric, which is a sign of structural changes in the nonwoven fabric. The results of FT-IR test of the samples show that the functional groups of the polyester spectrum are somewhat displaced in the vicinity of urea, which indicates the connection of NH_2 urea groups with the polyester fiber, indicates the reaction between them and with increasing The urea concentration of this matter has become significant. UV and AA tests also show that the amount of urea absorbed by the textile increases with decreasing size and concentration, and as an agar textile, the urea lasts longer. According to the results of strength test and the numbers obtained from strength to rupture and elongation to rupture of samples, it is clear that increasing the concentration of urea in the process greatly increases the elasticity and elongation to rupture. In a way that shows a 6-8% improvement, but due to the fiber bond, it reduces the tensile strength. By comparing the absorption wavelength of urea in different concentrations and changing the absorption wavelength, the results show that urea is placed in the fiber bed and the decrease in concentration causes the wavelength to approach the nano range. Therefore, in order to prevent the uncontrolled increase in the consumption of nitrogenous compounds due to the sublimation of common nitrogenous compounds in agriculture, it is necessary to reduce the size of urea and maintain it by non-tissue such as polyester to improve the reduction of chemical compounds in industry with the help of nanotechnology. Dad. This path can also be a way forward in related industries.

REFERENCES

[1] Patel M, Bhrmbhatt D. Nonwoven Technology for Unconventional Fabrics. M.S University: Vadodara; 2015: 5-7.

[2] Wilson A. Niche Nonwovens Outperform the Rest. Intr Fiber J 2014; 28(3): 14-7.

[3] Horrocks AR, Anand SC. Handbook of Technical Textiles. 1th ed. Elsevier; 2000: 327-30.

[4] Çinçik E, Günaydin E. The Influence of Calendaring Parameters on Performance Properties of Needle Punched Nonwoven Cleaning Materials Including R PET Fiber. J Textil.

[5] Priya S, Amsaveni. 2012. Edge Adaptive Image Steganography in DWT Domain. International Journal of Advances in Image Processing, 2:91-94

[6] Wu Y, Noonan J. 2012. Image Steganography Scheme using Chaos and Fractals with the Wavelet Transform. International Journal of Innovation, Management and Technology, Vol. 3, No. 3:285-289.

[7] D. P. Holmes, "Introduction to Digital Image Steganography", Feb. 2009.

[8] K. Korhorn, "Steganography Uses and Effects on Society", University of Illinois, 2009.

[9] R. Poornima and R. J. Iswarya, " An Overview Of Digital Image

Steganography “, International Journal of Computer Science & Engineering Survey (IJCSES) Vol.4, No. 1, February 2013.

[10] Kopitar D, Skenderi Z, Rukavina T. Impact of Calendering Process on Nonwoven Geotextiles Hydraulic Properties. Textile Res J 2014; 84(1): 66-77.

[11] Çinçik E, Günaydin E. The Influence of Calendaring Parameters on Performance Properties of Needle Punched Nonwoven Cleaning Materials Including R PET Fiber. J Textile Institute 2017; 108(2): 216-25.

[12] UNI EN ISO 26330:1996. Domestic Washing and Drying Procedures for Textile Testing.

[13] Prince A. Chemical modification of polyester [pet]. Fibre2Fashion Pvt. Ltd. India.

[14] UNI EN ISO 26330:1996. Domestic Washing and Drying Procedures for Textile Testin.

[15] British Standard Institution. BS 3356: Method for Determination of Bending Length and Flexural Rigidity of Fabrics. 1990.

[16] AATCC Test Method 66-2003. Wrinkle Recovery of Woven Fabrics: Recovery Angle, Technical Manual of American Association of Textile Chemists and Colorists. Res Triangle Park, American Association of Textile Chemists and Colorists 2003; 95-8.

[17] Abatal M, Garduza JP. Application of Multivariable 35[17]. Anguebes F, Pat L, Ali B, Guerrero A, Córdova AV, Analysis and FTIR-ATR Spectroscopy to the Prediction of Properties in Campeche Honey. J Analytical Method Chemist 2016; 2016.

[18] S. S. Bhattacharyaand S. B. Chaudhari, Int. J. Pure Appl. Sci. Technol., 21, 43 (2014).

[19] E. Rusu, M. Drobota, and V. Barboiu, J. Optoelectron. Adv. Mater., 10, 377 (2008).

[20] Anguebes F, Pat L, Ali B, Guerrero A, Córdova AV, Abatal M, Garduza JP. ApplicationofMultivariable Analysis and FTIR-ATR Spectroscopy to the Prediction of Properties in Campeche Honey. J Analytical Method Chemist 2016; 2016.

[21] E. Mohammed Khalaf, Int. J. Mater. Sci. Appl., 5, 297 (2016).

[22] Bais-Singh S., Anandjiwala R.D. and Goswami B.C., Characterizing Lateral Contraction Behavior of Spunbonded Nonwovens During Uniaxial Tensile Deformation, Text. Res. J., 66, 131-140, 1996

[23] Tamhane A. C. and Dunlop D. D., Statistics and Data Analysis, From Elementary to Intermediate, Prentice Hall, NJ, USA, 2000

مجله شیمی فیزیک و شیمی نظری
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بررسی خواص زیرلایه منسوجات پلی استر نبافته با استفاده از نانو اوره

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چکیده

با توجه به توسعه فناوری نانو و گسترش آن در صنایعی مانند نساجی، کشاورزی و ... و با توجه به اینکه نانوتکنولوژی باعث افزایش سرعت واکنش‌ها و کاهش مصرف مواد شیمیایی و بهبود شرایط محیطی می‌شود، لذا در این مطالعه روش‌های سنتز نانو اوره در پلی‌استر بستر و روش‌های آماده‌سازی و خواص ایجاد شده در این منسوجات به عنوان سایر منسوجات و ژئوتکستایل‌ها مورد استفاده قرار گرفت. در این تحقیق به منظور سنتز نانو اوره، ابتدا نمونه‌های اوره را به کمک آسیاب آسیاب کرده و روی بستر نساجی پلی‌استر آغشته کردیم. نتایج نشان می‌دهد که افزایش غلظت و زمان آسیاب در حذف محلول موثر است. افزایش غلظت محلول و افزایش زمان آسیاب نمونه‌ها تأثیر مثبتی بر جذب اوره توسط محصول دارد و بین نمونه‌ها تفاوت معنی داری وجود دارد. و پارامترهای ابعادی با استفاده از آسیاب انجام شده و در زمان‌های مختلف مورد بررسی قرار می‌گیرند. با غلظت‌های ۱۵۰۰–۵۰۰ ppm تهیه و در شرایط مختلف روی پارچه پلی‌استر نبافته به روش pad-dry-cure اعمال و در دمای اتاق خشک شد. در نهایت تست‌های اضافی FTIR-UV-AA و تست‌های مقاومت خمشی بر روی نمونه‌ها انجام شد. آزمایشات UV و AA نیز نشان می‌دهد که با کاهش اندازه و غلظت اوره، میزان جذب اوره توسط پارچه افزایش می‌یابد و به عنوان منسوجات آگار باعث می‌شود که اوره مدت بیشتری در خاک باقی بماند و زمان جذب توسط گیاه را تحمل کند. خم شدن نمونه، افزایش غلظت در نمونه‌ها نشان می‌دهد که ضخامت اوره سنتز شده افزایش یافته و به دلیل ساختار بی شکل فیلم، انعطاف‌پذیری را افزایش داده است که در طول و عرض پارچه متفاوت است. تغییرات ساختاری را نشان می‌دهد. پارچه نبافته است. نتایج آزمون FT-IR نمونه‌ها نشان می‌دهد که گروه‌های عاملی طیف پلی استر در حضور اوره تا حدودی جابجا می‌شوند. که نشان دهنده اتصال گروه‌های اوره NH2 با الیاف پلی استر است که نشان دهنده واکنش بین آنها می‌باشد و تست استحکام نشان می‌دهد که تا حد گسیختگی و کشیدگی مشخص شد که افزایش غلظت اوره در فرآیند، خاصیت ارتجاعی را بسیار افزایش می‌دهد. و طول را تا حد گسیختگی افزایش می‌دهد تا حدی که بهبودی ۸–٦ درصدی را نشان می‌دهد اما به دلیل ایجاد پیوند الیافی استحکام کششی را کاهش می‌دهد. نتیجه‌گیری: نمونه نساجی پلی استر نبافته با سنتز نانو اوره با مقایسه طول موج جذب اوره در غلظت‌های مختلف بر روی بستر پلی استر نبافته نشان می‌دهد که منجر به تغییر در طول موج جذب می‌شود و اوره در بستر الیاف قرار می‌گیرد و غلظت را کاهش می‌دهد. طول موج به محدوده نانو نزدیک‌تر است و به دلیل ساختار بی‌شکل فیلم باعث افزایش انعطاف پذیری شده است که در طول و عرض پارچه متفاوت است که نشانه تغییرات ساختاری در منسوجات است.

کلید واژه‌ها: پارچه نبافته پلی‌استر، نانو اوره، بهینه‌سازی، الیاف

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