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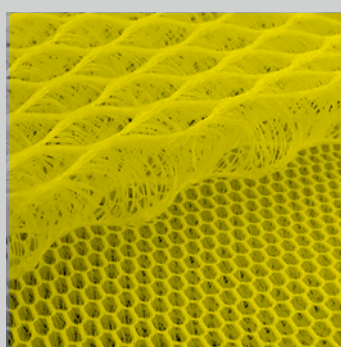
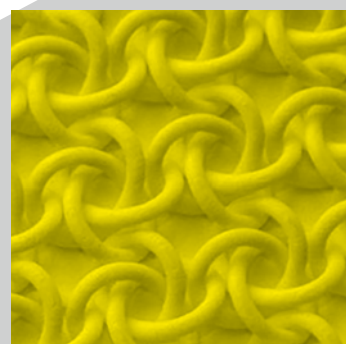
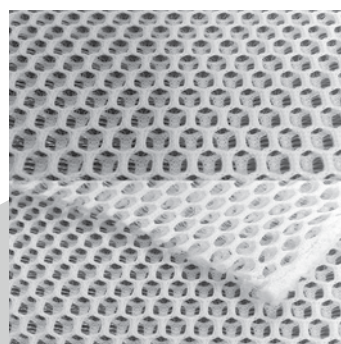
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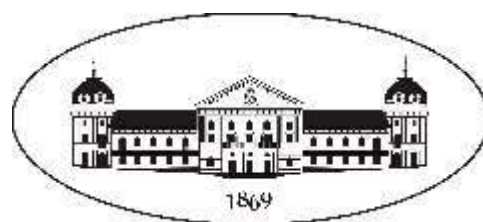
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BOOK OF ABSTRACTS

NATIONAL TEXTILE CONFERENCE - 2018



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ТЕКСТИЛ СЪВЕЩАНИЕ

НТС по текстил,
облекло и кожи



SPECIAL ISSUE 10/2018

BOOK OF ABSTRACTS

NATIONAL TEXTILE CONFERENCE - 2018

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XX National Textile Conference - Sofia

02 - 04.10.2018 g

The National Textile Conference on "Traditions and Innovations in Textiles and Garment" was held for the 20th time from 2 to 4 October 2018 in Sofia.

Organizer of the conference is the Scientific Engineering Union of Textile, Garment and Leathers, and hosted by Inter Expo Center Ltd. - Sofia. Within the framework of the research association the co-organizers of the conference were the Technical University - Sofia and its branch "Faculty and College - Sliven", the Institute of Polymers at the Bulgarian Academy of Sciences. Partners of the events in the conference were the university departments and the secondary schools in the country as well as the Federation of Scientific Engineering Unions in Bulgaria.

The Scientific and Organizational Committees of the Conference under the leadership of Professor Hristo Petrov provided excellent conditions for the presentation of the various works and discussions in the side-lines.

The first important event of NTC2018 was the meeting - round table "Staffing and Attractiveness of the Textile Profession". Representatives of state and public organizations, as well as representatives of the trade unions, the university community and teachers attended the meeting from the vocational and specialized secondary schools.

Over 50 university lecturers, researchers, experts, PhD students and students participated in the scientific sessions of the forum. Out of the 52 abstracts submitted in the program of the Scientific Sessions, 30 reports and 15 posters on the current trends in the technology of textiles, garment and design were presented.

All reported works reflect the efforts of research, university and industrial teams from the specialized departments and laboratories of TU - Sofia, UCTM - Sofia, NBU - Sofia, National Academy of Arts - Sofia, Institute of Polymers of the Bulgarian Academy of Sciences, Defense Institute - Sofia, SWU - Blagoevgrad, VFU "Chernorizets Hrabar" - Varna and MBBU - Botevgrad, PGTO Dobri Zhelyazkov - Sliven, NNG Dimitar Dobrovich - Sliven, Secondary school "Metodiy Draginov", Draginovo, Municipality of Velingrad, Bulgaria and the Museum of Textile Industry in Sliven.

The conference was attended by leading lecturers from the University of Haute Alsace in Mulhouse, France, Hanoi University of Science and Technology, SR Vietnam, University "Ss. Cyril and Methodius" - Skopje, Republic of Macedonia.

The conference ended with the awarding of the finest diploma theses and student projects. The submissions of the National Textile Conference 2018 will be published sequentially in the issues of the Textiles and Garment Magazine ISSN1310-912X (print), ISSN 2603-302X (online), which will be available to readers in university and public libraries as well as to the websites of SEUTGL: www.tok.fnts.bg and the publishing house of the association: www.bgtextilepublisher.org.

Compiled by:
Assoc. Prof. Ivelin Rahnev, PhD,
Chair of the Organizing Committee of NTC2018
SEUTGL

DAILY SCHEDULE

Of the XX National Textile Conference - NTC18 at the Inter Expo Centre - Sofia

1. First day: 02.10.2018

1.1.	13h00	Accommodation in hotel ATM - Sofia	ATM, reception
1.2.	14h00	Registration in NTC18	IEC, hall Musala
1.3.	14h30	Workshop "Staffing and attractiveness of the textile profession"	IEC, hall Musala
1.4.	16h00	Visit to the exposition of TMT Expo 2018	IEC, halls 1 and 4
1.5.	18h30 - 21h00	Welcome cocktail of the NTC18	IEC, central foyer

2. Second day: 03.10.2018 g.

2.1.	08h15 - 08h30	Registration in the NTC18	IEC, hall Musala
2.2.	08h30 - 09h45	5 presentations x 15 minutes, 5 reports	IEC, hall Musala
2.3.	09h45 - 10h00	Coffee-break with poster session	IEC, hall Vihren
2.4.	10h00 - 11h00	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
2.5.	11h00 - 11h15	Coffee-break with poster session	IEC, hall Vihren
2.6.	11h15 - 12h00	3 presentations x 15 minutes, 3 reports	IEC, hall Musala
2.7.	12h00 - 12h45	Working lunch	IEC, hall Musala
2.8.	12h45 - 13h15	4 presentations x 15 minutes, 4 reports	IEC, hall Rila
2.9.	13h15 - 13h30	Coffee-break with youth's exposition	IEC, hall Vihren
2.10.	13h30 - 14h30	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
2.11.	14h30 - 14h45	Coffee-break with youth's exposition	IEC, hall Vihren
2.12.	14h45 - 15h45	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
2.13.	15h45 - 16h00	Coffee-break with youth's exposition	IEC, hall Vihren
2.14.	16h00 - 17h00	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
2.15.	17h00 - 18h00	Visit to the youth's exposition	IEC, hall 4
2.16.	19h30 - 22h00	Gala dinner	ATM, restaurant

3. Third day: 04.10.2018 g.

3.1.	08h15 - 08h30	Registration in the NTC18	IEC, hall Musala
3.2.	08h30 - 09h30	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
3.3.	09h30 - 09h45	Coffee-break with youth's exposition	IEC, hall Vihren
3.4.	09h45 - 10h45	4 presentations x 15 minutes, 4 reports	IEC, hall Musala
3.5.	10h45 - 11h00	Coffee-break with youth's exposition	IEC, hall Vihren
3.6.	11h00 - 11h45	3 presentations x 15 minutes, 3 reports	IEC, hall Musala
3.7.	12h00 - 13h30	Working lunch	ATM, restaurant
3.8.	13h30 - 14h00	Award ceremony of the youth competition - 2018	ATM, restaurant
3.9.	14h00 - 14h15	Closing the conference	ATM, restaurant

- Inter Expo Center Ltd., 147, Tsarigradsko shose Blvd., 1784 Sofia, Bulgaria, <https://iec.bg/index.php/bg/> - IEC; TMT Expo 2018, www.tmtexpo.bg;
- Hotel ATM Center, Tsarigradsko Shosse 131, Sofia 1784, <http://www.atm-hotel.com/> - ATM.

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Topic № 1
FIBRES AND YARNS;
CHEMICAL TECHNOLOGIES;
NANOTECHNOLOGIES



TEXTILE MATERIALS IN TRANSDERMAL THERAPY

Daniela ATANASOVA¹, Desislava STANEVA¹, Ivo GRABCHEV²

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Achievements in drug delivery systems give new impulsion to transdermal therapy used from ancient times. It can affect a number of nutritional deficiencies, leading to problems in the immune, hormonal and nervous systems, to protect cells from oxidative destruction, to influence cancer formation and therapy in diabetic patients.

Textile materials play an important role in transdermal therapy as they are a suitable matrix for different active substances and can promote their gradual release. Textile materials are characterized by a variety of composition and structure, which allows meeting the requirements for specific treatment. The easy application of biologically active textiles leads to greater comfort and less pain for the patients, reduced hospital stay and so on. Aromatherapy, antimicrobial substances and painkillers, hormone therapy, psoriasis treatment, atopic dermatitis, melanoma, etc. are some of the areas where textiles can be used as carriers.

The possible application methods of biologically active substances to textile materials are varied. The oldest one is a pad-dry-cure method. Another widespread method is by microencapsulation. In the recent years, research is aimed at new structure as cyclodextrins, aza-crown ethers, fullerenes, liposomes and polymeric micelles. Numerous functional groups and the ability to encapsulate different substances determine dendrons and dendrimer molecules as promising carriers for drug delivery. Hydrogels are also high molecular hydrophilic structures with which the textile material can be modified. They absorb a large amount of water or biological fluids and can support the delivery of medicines.

These characteristics correspond to one of the current trends in the development of materials used in transferral therapy. This is intelligence, i.e. controlled concentration and time delivery of the active substance and simultaneous visualization of the process, which can only be achieved with appropriate and purposeful modification of the textile material.

Keywords: transdermal therapy, smart textile, drug delivery

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COLLAGEN AND KERATIN – WASTE PRODUCTS FROM LEATHER AND TEXTILE PRODUCTION AND METHODS FOR THEIR UTILIZATION

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The production of leather and leather goods is the world's largest industrial sector, which uses by-products. It processes the potential meat waste into high quality consumer goods. But at the same time, the leather industry is one of the most intense pollutants of the environment, releasing: carrion (decomposing subcutaneous tissue), leather, hair, soluble proteins, fats, chemicals. The textile industry also generates a significant amount of hair waste during the production and processing of wool. The leather and hair waste contains valuable raw materials: collagen and keratin.

Collagen waste includes meat waste (~ 60%). Every year, biomass over 50 billion t collagen is accumulated in the world, and only ~ 4 million t are used. Also, keratin waste exists in abundance, i.e. these are waste from the leather and textile industries, from slaughterhouses, poultry farms, etc., estimated at 5 million t globally.

Collagen and keratin isolated from leather and textile waste are applied in the following areas: 1) obtaining new materials for the leather industry; 2) in food processing and other industries (paper, furniture); 3) in agriculture as organic fertilizer components and feed mixtures; 4) in cosmetics, pharmacy; 5) in medicine such as collagen and keratin biomaterials and as biocomposites - in combination with other materials (other natural or synthetic polymers, ceramics).

We have synthesized biocomposites based on collagen and polyurethane and analyzed their biocompatibility and physico-mechanical properties, proving their application in tissue engineering.

The main methods for processing of collagen- or keratin-containing waste include various types of hydrolysis: alkaline, acidic and enzymatic. Recent studies have focused primarily on the environmental impact of these processes and the enzymatic processing of collagen containing raw materials is the most environmentally friendly.

The extraction of keratin hydrolysates is accompanied by a number of difficulties due to the nonreactivity and resistance of keratin and consequently the hydrolysis processes are carried out at drastic conditions and with the participation of aggressive reagents. In addition to peptide bonds, the presence of disulfide bonds greatly obstructs the course of these processes. It has also been proven that the pre-alkali treatment of raw materials facilitates these processes. Nevertheless there is a progress in the extraction of keratin products and their use as biomaterials. Experimental we also have obtained keratin hydrolyzates from goat hair and sheep wool using various reducing agents and various reaction conditions.

Optimizing hydrolysis procedure is of great importance to environmental protection and to receive energy-saving technologies in this field.

Keywords: collagen, keratin, hydrolyzates, biocomposites

DETERMINATION OF THE GEOMETRIC CHARACTERISTICS OF THREADS AND FABRICS THROUGH MICROSCOPE MEASURING

Diana GERMANOVA-KRASTEVA, Rositsa STEFANOVA

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Introduction

With the invasion of the computer technologies, the software products for capturing objects and processing their video images received a widespread application. The method for investigation of textile structures is not standardized, but is increasingly used because of its non-destructive character and possibility to measure geometric characteristics which can't be determined otherwise or which determination by conventional testing methods causes difficulties. The measurement of the characteristics in woven state (non-destructive) inevitably shows differences from the free-state (destructive) measurement, mainly due to the deformation of the threads in the weave formation.

The aim of the work is to determine the degree of deviation between the results obtained by the standardized destructive methods and the non-destructive microscopy.

Experimental part

The experiment was carried out using the following four groups of fabrics made from: 100% Cotton; 50/50% Cotton/Polyester; chemical fibers (100% PES and 100% Rayon) and 100% Wool. For each group, three representatives were selected.

The digital images were obtained and measured by means of system of Motic (Germany) including a stereomicroscope, a digital camera, and software for capturing and measuring geometric dimensions.

The diameters of the warp and weft threads, as well as the distances between them, were measured. From the distances, the threads' densities were calculated. By the gravimetric method the counts of the threads are determined and the diameters were calculated empirically.

The relative deviations between the results obtained by the standardized methods and by microscopy were determined. Correlation and regression statistical analyzes have been carried out.

Results

It was found that the diameters obtained by microscopic measurements are 11% higher than these received after recalculation of the count determined according to the gravimetric method. A strong statistical relation between the diameters determined by both methods ($R = 0.97$) was found, and therefore a linear regression equation was derived.

Regarding the thread densities in the weave, the deviations between both methods are considerably smaller: 1.5% for the warp threads' density and 4% for the weft threads' density. Due to the strong statistical dependence ($R = 0.95$), a regression equation was produced.

Discussion

The deviations between methods studied are lower for the warp thread diameters than for the weft ones, because of the higher torsion intensity and greater compactness of the warp yarns. Lower are the differences for the warp thread densities, as well. The reason is the greater uniformity of threads' warping compared to the weft insertion.

Conclusion

The differences between non-destructive and destructive methods for measuring of threads' and fabric geometry are determined and analysed. Linear regression equations have been derived that allow a recalculation of results obtained.

Keywords: Non-destructive analysis, microscopy, diameter of threads, threads' densities in the weave.

UDC677

INVESTIGATION THE POSSIBILITY OF CHROME FREE "WHITE" TANNING WITH DMT – II PRODUCT OF ENZYMATICALLY TREATED SHEEPSKINS

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Introduction

Chrome tanning has for a long time enjoyed a unique position amongst tanners all over the world and almost 90 % of all leather produced is chrome tanned.

A number of studies have been published recently suggesting that Cr(III) itself may be toxic at higher levels under certain ligand environments and also that Cr(VI) is a known carcinogen. In view of this tanners have to consider how best to modify their tanning agents and technology. For this reason, the market has shown a growing demand for "ecological" products, especially using alternative tanning agents different from chromium, such as metallic substitutes - Al, Zr, Ti, Li. Part of these guidelines is the so-called "white tanning". The aims of this work are to study the possibility of "white" tanning of enzymatically treated sheep skins with a new product DMT - II.

Experimental part

Materials, procedures and analytical methods

DMT-II - previously prepared mixed tanning agent, complex of Zr-Al-Ti; Cr tanning product; sheep skins;

Shrinkage temperature (Ts), antibacterial activity, common water removable, true pore volume and physical properties of the leathers were tested by the standard methods.

A new Zr-Al-Ti combination tanning salt (in an appropriate ligand environment) has been prepared. Leathers processed using these tanning salt exhibit shrinkage temperature within the range of 110°C to 121°C. It has been observed that the addition of Zr and Ti leads to improvement in the antimycotic properties. In this study we compare two samples of sheep skins by changing the composition agents. The tensile strength is highest when we used Cr tanning agent.

Conclusions

1. The tanned leathers are suitable for production of leathers for clothing and gloves according to BDS;
2. The tanned leathers with DMT-II are suitable for the article "white" leather;
3. DMT-II product is a very suitable substitute for chromium tanning;
4. In all tanning variants, the leathers have antibacterial activity, strongly expressed in the DMT-II products;

Keywords: chrome - free tanning, sheep skins, zirconium, titanium, aluminium

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A STUDY ON ELECTRICAL RESISTANCE OF CONDUCTIVE THREADS WITH APPLICATIONS FOR SMART TEXTILES

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Abstract

Nowadays the development of smart devices is a worldwide trend. In the field of the design and construction of textile products, smart devices are those with embedded electronic components with primary application in the field of medicine. Their main purpose is a real-time measurement of various parameters of the human body and the environment to evaluate both the human health and comfort. The variables that can be monitored are, for example, the skin temperature, heart rate, amount of moisture, pH, and nitrate levels among others.

The textiles and clothing play a role of a carrier phase and are preferred over other materials for several reasons: they are an insulation barrier between the human body and the environment, not expensive, easy for production, and provide comfort and convenience.

When implementing electronic components into fabrics, several problems can arise, related with both the manufacturing and the exploitation of the smart item. One of the critical issues is the secure connection between the individual modules that build the smart system. Because of the stretching of the textile (knitted or woven) during wearing, the traditional wires should be replaced by conductive threads.

There are several ways to implement a conductive thread into a textile. It can be incorporated for example in the textile during weaving, but most frequently it is sewn into the textile structure. There are two types of conductive threads. The first one is from stainless steel filaments or fibres, which can be metal-wrapped, metal-filled and metal-twisted. The second type is the traditional non-conductive filaments plated with silver or copper.

The primary parameter of the conductor is the electrical resistance, which depends on the type of the material. During wearing of the smart textile or smart clothing, it is a subject of stretching, which means that the conductor is under stress conditions.

The main goal of the present paper is to measure the electrical resistance of two type of conductive thread under various loads, reaching the limit of ultimate strength. This will give valuable information in the design stage of the smart textile system for the calculation of the designed electronic circuit, as well as the energy consumption. The conditions during the maintenance of the smart textile are also tested, such as washing and drying cycles. An analysis is made of these effects on the electrical conductivity of the threads, and especially the naturally occurred wearing process that may cause interruption of the electrical connection, particularly of coated conductive threads.

Keywords: smart textile, conductive threads, electrical resistance.

COMPARATIVE DESCRIPTION OF THE SURFACE AND STRUCTURAL EFFECTS ON FIBRE-FORMING POLYMERS AT THE PHYSICO-CHEMICAL TREATMENT OF THE TEXTILE MATERIALS

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The physicochemical treatment (FCT) of fibrous materials accompanies the mechanical technology of textile products from fibre to fabric.

In some cases, FCT acts predominantly on the surface of the fibres, i.e. on the peripheral molecules of the textile substrate. This is the case for dyeing where chemical bonds between dye molecules and peripheral fibre molecules are obtained by ion exchange. One of the peculiar and up-to-date dyeing processes is the transfer printing. By its nature, this dyeing process adhere the microparticles of the dispersion dye onto the surface of the fibres. There is no chemical interaction between the textile substrate and the dye substance. The adhesion between the dye and the textile is due to the short-term melting of the textile fibre peripheral layer and the penetration there of the dispersed microparticles of the dye. In order to achieve this superficial and short-lasting melt, it is necessary to heat the entire mass of the textile substrate as well as the entire fibre volume. As a result, even for surface treatment at a depth of no more than 150-200 nm, and without chemical interaction, heat treatment of the fibre-forming polymer occurs.



In other cases, FCT acts predominantly on the structure of fibre-forming polymers. These are all processes of the final treatment, finishing of the raw woven fabrics. Washing, fixing and drying of fabrics have the greatest impact on their geometric dimensions. This reflects directly the sharp change in the amplitude and the denseness of the undulating deformations of the warp and weft threads. All subsequent finishing processes in various forms represent moisture - heat treatment, which aims and achieves uniformity of the deformations on the fibres and the threads. Thus, the fabrics obtain a smooth and even surface.

Subject of this article is the equilibrium between the surface and structural effects of FCT on the properties and the behaviour of the fibrous materials. Aim of the work is to determine the exact parameters of the effects such as depth of penetration and degree of change of initial parameters of fibre-forming polymers. The tasks of the initial stage of studying this issue include literary research, technological observation and technology gathering.

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The authors thank E. Miroglio EAD - Sliven for the support and assistance in the performance of the graduate work at the College - Sliven of the Technical University - Sofia and presentation of the results of the National Textile Conference in 2018.

DEPOSITION OF SILVER COATINGS ON TEXTILE FIBRE SUBSTRATES BY MEANS OF ION-BEAM SPUTTERING IN A VACUUM MEDIUM

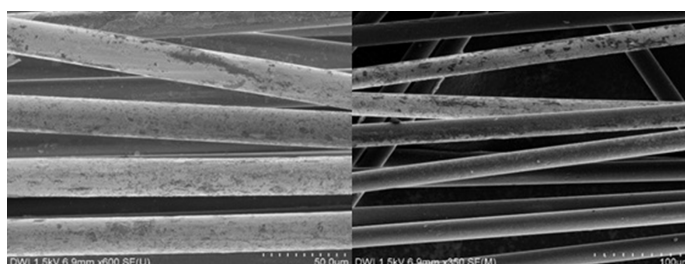
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The experiments carried out show that the deposition of metallic coatings in particular silver on textile substrates in a vacuum environment by means of an ionic plasma beam is possible and feasible. The main task, namely the deposition of thin-film silver coatings on textile fibres in the vacuum environment, was successfully achieved.

The preliminary experiments carried out in the dissertation show that the deposition of electrically conductive materials, pure silver 99, 99% on textile panels, yarns and tapes is possible, but the established electrical conductivity is insufficient to obtain low electrical resistance.

The results of the metallised fibres tests showed the preservation of the qualitative characteristics of the substrates after the ion metal metallisation, namely their flexibility, plasticity and softness typical of the textile fibres.



The plasma finishing in the vacuum medium then not only complements the final cleaning of the fibres, but also contributes to the activation of the surface of the fibre mass. The extraction voltage should not exceed 100 V, and the plasma etching time should not be longer than 3 min.

The thickness of the metallic coating ensures the maintenance of the technical and mechanical characteristics of the fibres. The morphological and chemical analyses of the deposited coatings confirm the results obtained and facilitate the establishment of specific and strictly validated process parameters to achieve permanent metallisation and good adhesion performance.

Clear and accurate vacuum deposition parameters have been developed that can be repeatedly reproduced. Ionic plasma deposition under vacuum was the correct method for metallisation of substrates that cannot be subjected to high temperature loads by another vacuum plasma method. Because of the low process deposition temperature, this metallization method is particularly distinguished from the other methods known and described in this dissertation thesis. The experimental results presented in this dissertation thesis can be fundamental for further research on metallised textile fibres and their derivatives.

Acknowledgments

The authors thank E. Miroglia EAD - Sliven for the support and assistance in the performance of this doctoral work at the College - Sliven of the Technical University - Sofia and presentation of the results of the National Textile Conference in 2018.

Keywords: polyester fibres, silver coating, ion-beam sputtering, vacuum.

UDC678

SINGLE AND BUNDLE COTTON FIBRES MECHANICAL PROPERTIES MODELLING USING ANALOGICAL MODELS

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Abstract: Among the many properties of cotton fibers, mechanical ones are the most important indicators to select the proper fibers for specified textile end use applications. Either the single cotton fibers properties or the spun yarn ones are related not only to their tensile properties, but also to the time dependent ones such as the creep and the stress relaxation. In addition, the frictional behavior of cotton fibers greatly influences their processing, their performance and the performance of the final product.

In this paper, two methods of cotton fibers testing are presented: single fibers and bundles. Three different types of cotton fibers were studied, having different physical properties (maturity, fineness, micronaire, length, tenacity etc.). We show that the creep behavior of cotton fibers can be assimilated to a Voigt model in series with a spring and that the difference in the behavior between the single fibers and bundles is related to the inter-fiber friction.

Studying the behavior and the relationships between single and bundle cotton fibers mechanical properties is very crucial. In fact, single fibers are the fundamental units of a spun yarn [1]. Any study of a yarn model must include the parameters of the fibers and their relationships. In general, fibers physical properties (fineness, diameter, shape factor and length) contribute to yarn strength through two factors: fiber strength and inter-fiber friction. For this purpose, we aim to analogically model the cotton fibers relationships and to study the inter-fiber friction in the bundle of cotton fibers.



Cotton fibers contain natural polymers (90% of cellulose), and therefore they exhibit a viscoelastic behavior [2]. This mechanical behavior can be adjusted using analogical models consisting of elements such as Hook springs, Newton dashpots, as shown in table 1, which could simulate the mechanical behavior of the material under mechanical stress when correctly combined.

These models are very useful to clarify how fiber behaves. They can be assembled both in series or in parallel or in mixed groups [3]. Thus, more complex mechanical responses can be simulated to illustrate the behavior of the material submitted to static test (tensile test) or a time dependent one (creep or stress relaxation tests).

Keywords: Bundles, cotton, inter-fiber friction, modelling, single fibers.

CHROME FREE TANNING - AN INVESTIGATION OF ALUMINIUM COMBINATION TANNING WITH SUMAC, MIXED SUMAC-METAL AND CLAY PRODUCTS

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Introduction

Currently, there is a globally growing requirement for wet-white leather products, including automotive leathers, upholstery leather and garment leather with considerable high-quality and high value-added characters. The wet white tanning approach produces non-polluting and non-toxic solid wastes and has substantial environmental benefits because of its significant reductions in hazardous waste disposal and the level of chemicals in the effluents. Therefore, wet-white tanning is considered as a feasible alternative to conventional chrome tanning for chrome free leather manufacture.

Experimental part

Materials, procedures and analytical methods

C0 - previously prepared vegetable (sumac) tanning agent

C24 - previously prepared mixed vegetable-metal tanning agent, complex of TiO₂ with sumac extract

Al tanning agents- Lutan B, Tanit AGS, clay product, sheep skins

In this study we compare three samples of sheep skins tanned in three variants by changing the composition agents. Shrinkage temperature (Ts), antimicrobial activity, anti-UV property and absorption for colorimetric measurements, common water removable, true pore volume and physical properties of the leathers were tested by the standard methods.

Results and discussion

Tanning complexes in new products have a low degree of cross-linking of collagen of the dermis. Shrinkage temperature (Ts) of the tanned three sheep skins is within the range of 60°C to 64°C. The tensile strength are highest when we used the Al tanning agent in the pickle bath. The results obtained convincingly prove the antimycotic properties of the products and their anti-UV property of the proposed treatment.

Conclusions

1. The tested tanning agents mostly are deposited on the collagen fibrers
2. The tanned leathers with Al tanning agent in the pickle bath leads to their lightening
3. The wet -white leather exhibits higher absorbance or lower transmittance in the near UV region and exhibits the enhanced anti-UV property
4. The titanium content of the complex C24 gives an increased antibacterial effect

Keywords: chrome - free tanning, sheep skins, complexes, vegetable tannin, titanium, aluminium; clay

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CURCUMIN-LOADED FIBROUS MEMBRANES WITH COMPLEX ARCHITECTURE AND BIOLOGICAL ACTIVITIES

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Introduction Curcumin (Curc) is a naturally occurring polyphenolic compound with anti-inflammatory, antibacterial and antitumor activities. However, its clinical application is limited by its poor bioavailability related to its extremely low water solubility. In the recent years, electrospinning has emerged as a very suitable technique for preparation of drug-loaded polymeric materials. It has been shown that electrospun fibrous materials are suitable carriers for enhancing the bioavailability of Curc [1, 2].

Experimental part Cellulose acetate (CA, Aldrich) with $\overline{M_n} = 30\,000$ g/mol and DS 39.8%, polyvinylpyrrolidone (PVP, Fluka) with M_r 24 000 g/mol and curcumin (Merck) were used. Acetone (Sigma-Aldrich) and ethanol (Sigma-Aldrich) of analytical grade of purity were used.

Results Curc release profile was modulated by varying the electrospinning/electrospraying techniques and the polymer matrix composition. The incorporation of PVP facilitated Curc release. The enhanced Curc solubility is related to its ability to form hydrogen bonds with certain polymers such as: PVP, polyethylene glycol and CA, undergoing transition from crystalline to amorphous state.

Discussion Our findings reveal that the use of electrospinning in conjunction with electrospraying provides more possibility to modulate the composition and architecture of the obtained materials. It was found that the incorporation of Curc imparted antibacterial properties against the pathogenic microorganisms *S. aureus* and *E. coli* and antitumor properties to the obtained novel membranes.

Conclusion Curc-loaded membranes have been successfully prepared by conjunction of electrospinning and electrospraying techniques. The incorporation of the water-soluble polymer modulates the wetting of the membranes and facilitates the dissolution and release of Curc. The obtained fibrous membranes exhibit antibacterial and antitumor activities.

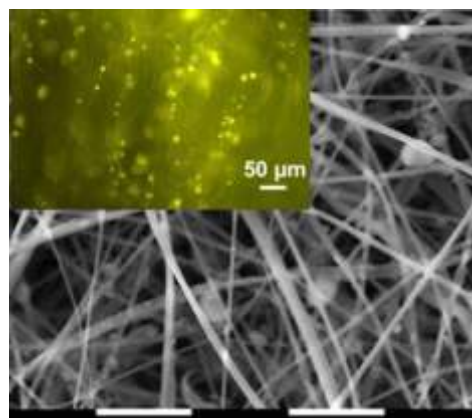
Keywords: curcumin, fibrous membranes, antibacterial and antitumor activities.

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UDC678



POTENTIAL OF THE DENDRIMER ARCHITECTURE AS A NOVEL ANTIMICROBIAL AGENT FOR TEXTILE

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In the recent years, a new class of antimicrobial agents has been actively studied. Unlike low and high molecular compounds, the dendrimers have a higher antimicrobial activity at low concentration. The large numbers of functional groups on the dendrimer surface allow the binding of many small molecules with antimicrobial activity. Thus, a large dose of a biologically active substance can be delivered with only one molecule. The antimicrobial effect may additionally be enhanced by reaction of the internal functional groups with metal ions or by encapsulating nanoparticles or other biological active substances. This allows better control over the processes of bacterial resistance and biofilm formation.

The development of technologies for the application of the dendrimers in the production of antimicrobial textile materials is a new current direction with a large multi-billion market. The challenge is to achieve an appropriate biocide activity combined with stability under conditions of use and maintenance while preserving the specific properties of the textile.

In the production of antimicrobial textile material, a number of factors should be considered, such as the application areas of the material, the type of textile material, the chemical structure of dendrimer and its concentration, the methods for the application of the dendrimer to the textile material, the preparation of the metal complexes and the reduction of metal ions to nanoparticles.

Keywords: textile, antimicrobial, dendrimer, metallodendrimer, nanoparticles

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CAFFEIC ACID PHENETHYL ESTER- CONTAINING ELECTROSPUN FIBROUS MATERIALS WITH ANTIBACTERIAL AND ANTIOXIDANT PROPERTIES

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Introduction During the last decade, the use of electrospinning for the fabrication of drug-loaded nanofibrous materials for biomedical applications such as wound healing dressings has evoked considerable interest [1]. The size-related properties of these materials, and the possibility to control their properties by controlling their architecture, the fibers morphology, porosity and composition, can lead to control on the drug release, enhancement of the drug bioavailability and avoiding side effects. Electrospun fibrous materials are very promising for topical delivery of drugs. Caffeic acid phenethyl ester (CAPE) is one of the main components in honeybee propolis. While possessing a number of valuable biological properties such as antioxidant and antibacterial activities, it is poorly soluble in water and body fluids, which predetermines its low bioavailability. Therefore finding routes to preparation of CAPE-loaded fibrous materials is of particular interest.

Experimental part CAPE-containing fibrous materials were prepared according to the procedure described earlier [2]. The morphology of the fibrous materials was evaluated by scanning electron microscopy (SEM) with Jeol JSM-5510 (Jeol Ltd., Japan). The in vitro dissolution test was carried out spectrophotometrically. The antibacterial activity of the CAPE-containing fibrous materials against *S. aureus* and *E. coli* bacteria was evaluated by using the viable cell-counting method. The antioxidant activity of CAPE-containing mats was measured using the DPPH assay.

Results and Discussion In the present study novel fibrous materials with enhanced aqueous solubility of CAPE and with facilitated CAPE release were successfully prepared. These materials were obtained from poly(3-hydroxybutyrate) (PHB) by applying electrospinning or electrospinning combined with dip-coating. The release of CAPE was affected by the composition of the polymer matrix and the method of preparation. Incorporation of polyvinylpyrrolidone (PVP) in the bulk of the fibers or in a coating on the fiber surface, and exploitation of the ability of this polymer to form hydrogen bonds with CAPE, resulted in enhancement of CAPE solubility. It was found that CAPE when incorporated in the bulk of the fibers or in a PVP coating on the fiber surface was in the amorphous state which is favorable for utilization in drug dosage forms. Microbiological tests revealed that the fibrous materials containing CAPE exhibited biocidal effect against the pathogenic *S. aureus* and *E. coli* bacteria. The obtained materials exhibited good antioxidant activity similar to that of free CAPE.

Conclusion The results suggest that the obtained novel fibrous materials containing CAPE are potential candidates for wound dressing applications.

Keywords: electrospinning, caffeic acid phenethyl ester, antibacterial fibers, antioxidant fibers

Acknowledgment: The authors thank the National Science Fund of Bulgaria for the financial support (Grant DFNI-T02/1-2014).

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NOVEL ELECTROSPUN FIBROUS MATERIALS OF ALIPHATIC POLYESTERS AND THEIR STERILIZATION - CHALLENGES AND SOLUTIONS

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Introduction Aliphatic polyesters have become one of the most preferred polymers for developing new generation devices for biomedical applications. Electrospinning has justifiably found its place among the most effective techniques for designing diverse micro- and nanofibrous materials. Electrospinning renders possible obtaining fibrous materials with no significant phase separation from otherwise immiscible poly(L-lactide)(PLLA) and poly(butylene succinate) (PBS) [1]. Since electrospun fibrous materials from such polyesters are very convenient for use in biomedicine, their sterilization is often necessary. Sterilization of polymeric materials commonly meets an obstacle related to their thermal and hydrolytic stability. The aim of the present work is to propose a suitable approach to overcome this problem.

Experimental part For the synthesis of PDLA-b-PBS copolymers poly(D-lactide) (PDLA) and PBS with Mn 4000 and 2000 g/mol, respectively, were used at a PDLA/PBS molar ratio = 9/1 or 1/1. The copolymers and high-molar-mass poly(L-lactide) (HPLLA, Unitika 6201, MW=95000 g/mol) were used for preparation of stereocomplex-based fibrous scaffolds [2].

Results By electrospinning new fibrous materials from stereocomplex between HPLLA and PDLA-b-PBS were prepared. The stereocomplex formation was evaluated by DSC and X-ray analyses. The thermal properties and the crystal structure of the new stereocomplex-based fibrous materials depended on PBS content in the copolymers. The thermal degradation profile of the mats strongly depended on PBS content. Two methods for thermal sterilization were applied under standard conditions - autoclaving at 121°C for 20 min at 1 atm, and dry heating at 160°C for 2 hours. Microbiological tests revealed that the fibrous mats were sterile.

Discussion The melting temperature of stereocomplexes is significantly higher than that of the enantiomeric polylactides and exceeds 200°C. Therefore, it was appropriate to exploit this advantageous property and to prepare electrospun materials suitable for sterilization. It was proved that thermal treatment was not detrimental to the morphology of the fibrous materials.

Conclusion The proposed use of stereocomplex formation between aliphatic (co)polyesters for the preparation of fibrous materials by electrospinning turns a promising route to the fabrication of sterilizable fibrous scaffolds for use in biomedicine.

Keywords: electrospinning, stereocomplex, aliphatic polyesters, sterilization

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FROM MICROBEADS TO MICROFIBERS BY ELECTROSPRAYING/ELECTROSPINNING – EFFECT OF CELLULOSE ACETATE CONCENTRATION

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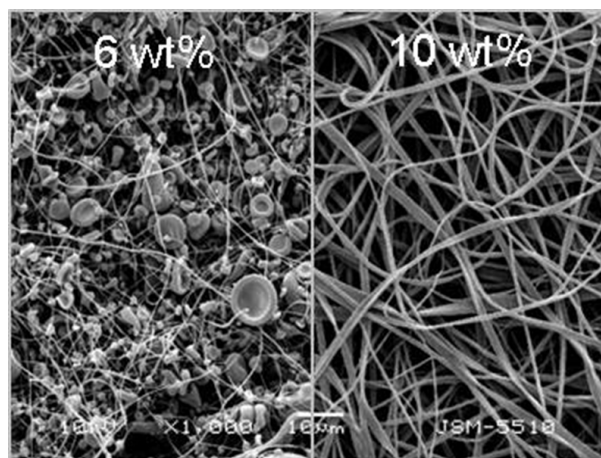
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Introduction Cellulose is the most abundant naturally occurring polysaccharide. Cellulose can be converted upon acetylation to cellulose acetate. The advantages of the resultant cellulose acetate is that it could be easily dissolved or melt and could be shaped into fibers, films, sheets, tubes, pellets or other products. In recent decades, great attention has been paid to fibers from cellulose and cellulose derivatives due to their low cost, lightweight, easy processing, biodegradability, good mechanical and barrier properties and recycling. Recently, the electrospinning technique has been considered as a versatile and effective method for manufacturing nanofibrous materials with high surface-to-volume ratio and multi-porous structures.

Experimental part Cellulose acetate (CA, Aldrich) with $\overline{M}_n = 30\,000$ g/mol and DS 39.8%, was used. Acetone was of analytical grade of purity and was purchased from Sigma-Aldrich.

Results Fibrous materials were prepared from CA solutions by conjunction of electrospaying with electrospinning. The polymer concentration was varied: 6, 8, 10 and 17 wt%. The effect of the polymer concentration on the viscosity of the spinning solutions and on the morphology of the obtained electrospun mats was evaluated. Scanning electron microscopy (SEM) images revealed that beaded fibrous structure was observed at concentrations below 10 wt%. The experimental results showed that defect-free fibers with mean fiber diameter of 780 ± 110 nm were obtained at 10 wt% concentration of CA in acetone/water. Electrospinning of CA solution with concentration of 17 wt% resulted in preparation of fibers with large diameters ($\sim 3.5\,\mu\text{m}$).



Discussion Our findings reveal that the viscosity of the spinning solutions and the morphology of the obtained fibrous mats were greatly influenced by the CA concentration in the solutions. The formation of beads at lower polymer concentrations and the increase in fiber diameter with increase in solution concentration was attributed to the changes in viscosity of the solution. Solution viscosity is related to the extent of polymer chain molecules entanglement within a solution.

Conclusion CA microbeads and fibers were prepared by electrospaying/electrospinning. The solution concentration was varied. The beads size and fiber diameter were greatly influenced by the concentration and the viscosity of the solution. The optimal conditions for preparation of defect-free CA fibers were found: polymer concentration of 10 wt% (dynamic viscosity - 122 cP), tip-to-collector distance - 15 cm and applied voltage of 25 kV.

Keywords: cellulose acetate, concentration, electrospaying, electrospinning, morphology.

UDC678

STUDY THE IMPACT OF NANOPOWDERS Si_2C ON THE BALLISTIC CHARACTERISTICS OF ULTRA-HIGH-MOLECULAR-WEIGHT POLYETHYLENE

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Introduction Ballistic protection products, it is necessary to use materials to create a lightweight armor that is light and provides comfort when wearing it. Combining the properties of metal alloys, fibers, polymer materials, textiles, nanopowders by reinforcing them with a high polymer matrix can provide high ballistic protection.

The aim of this study is to create a lightweight model of product for individual ballistic protection by combining the properties of heterogeneous materials into a single composite system that provides reliable protection and wearing comfort. High molecular weight polyethylene, nanopowders Si_2C , polymers with a high strength are embedded in a single system without significantly changing parameters such as the weight, thickness and density.

Materials and experimental procedure Created is a composite system of Polyvinyl butyral (PVB), micro particles (Si_2C) applied to high molecular weight polyethylene (UHMWPE).

The ultra-high molecular polyethylene (UHMWPE) is a multilayer fabric synthetic produced by Dyneema® SD. The fabric is 1 mm thick and has a mass of about 140 g/m². The construction of multilayer polyethylene fabric is a reinforcement that gives mechanical strength and elasticity to the individual ballistic protection means.

Polyvinyl butyral (BUTVAR B-98), manufactured by ACROS Organics (The Netherlands), is a white powder dissolved in ethanol to create a highly viscose resin which after curing creates a strengthening matrix.

Silicon carbide (Si_2C) have particle size $D_{\text{part}} = 0 \div 5 \mu$ (microns). is a material that gives high strength and chemical stability.

Technological possibilities that eligible materials for applying the resin, such as PVB, with Si_2C , which improve adhesion on Dyneema® SD fibers is showed on *Figure 1*.

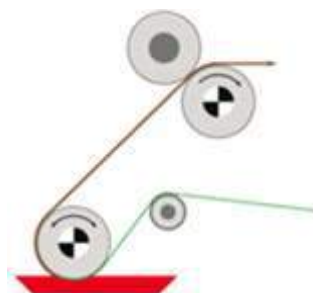


Figure 1 Deeping the textile in matrix solution

Keywords: Armor, ballistic protection, Si_2C , polyvinylbuteral, ultra-high molecular polyethylene (UHMWPE).

UDC678

INITIAL STUDY OF THE MORPHOLOGICAL AND GEOMETRIC PARAMETERS OF KAPOK FIBRES

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Textile products of cotton and cotton-type fibrous blends have a wide variety of fibre combinations, construction and colour. One of the current trends for their diversification when preserving the natural origin of the raw materials is the incorporation of exotic and atypical plant fibres. Such a type of fibre is the kapok. Its filamentous plant *Ceiba pentandra* grows to 73 m, and the commercial tree is most heavily cultivated in the rainforests of Asia, notably in Java, the Philippines, Malaysia, and Hainan Island in China, as well as in South America. The tree grows in the tropical regions in the countries: Myanmar, India, China, Bangladesh and others.

Previous attempts to apply the kapok fibres to cotton spinning have identified the following main dependencies: Applying more than 20% of the kapok fibres abruptly reduces the technology patency of the spinning blend. Kapok fibres are light, very buoyant, resilient, resistant to water, but it is very flammable, so they are hard to process in the spinning process stream, and usually make healthier working conditions worse.

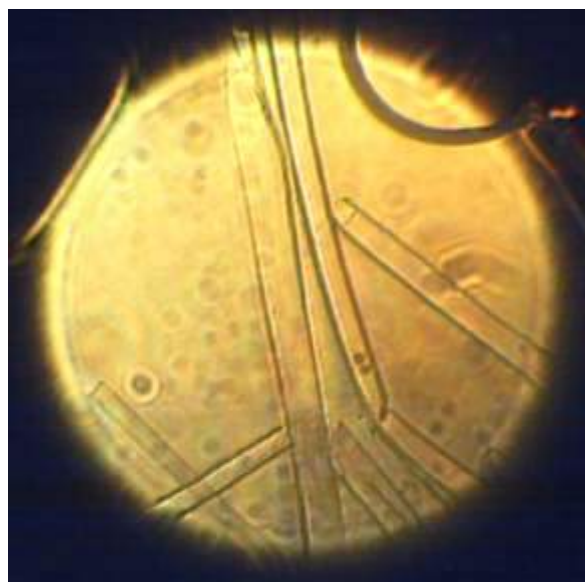
Regardless of the limitations mentioned above, the kapok fibres add extra softness and glow to the yarn. Textile products gain a noble appearance and increased commercial value.

The major problem of the industrial application of Kapok fibres lies in the inadequate knowledge of their properties and technical characteristics. There is an initiative to study these fibres, which in its initial stage focuses on a description of their morphology and thickness. Microscopic photographs show that these fibres are fine and have a smooth almost cylindrical surface. Laboratory measurements of their fineness with FADA showed an average thickness of 10.23 μm , with a relatively large variation coefficient of 35.0%.

Subject of this article are the morphology description and the geometric parameters of the kapok fibres. The aim of the work is to complementary study the properties and characteristics of these fibres as well as their possible application in a card spinning mill with conventional technological equipment. Implementation tasks include a literary study, a laboratory test of available experimental samples, and a metrological description of the fibres.

Acknowledgments The authors thank E. Miroglio EAD - Sliven for the support and assistance in the performance of this post-doctoral work at the College - Sliven of the Technical University - Sofia and presentation of the results of the National Textile Conference in 2018.

Keywords: atypical fibrous rows, kapok fibres, carded spinning.



NEW TRENDS IN PRODUCTION OF NONFLAMMABLE TEXTILE MATERIALS

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The development of new technologies for the production of non-flammable textile materials is more current nowadays than ever before. Despite the achievements in this area and the availability of a large number of excellent quality products, a rethinking of their applicability from the point of view of health, ecology and recycling is under way.

The task is relatively difficult because the new substances, the technology for their application to textile materials and their consumer qualities must meet a number of requirements.

Halogen or formaldehyde containing or realizing substances have a restriction on use. The new trends in flame retardants are related to the achievements of nanotechnology and the use of natural phosphorus containing polymers (phytic acid, casein, DNA, etc.). Different methods are used for their application as pad-dry-cure method, knife over roll method, layer-by-layer assembly, sol-gel process, covalent attachment, plasma deposition.

The other trend in functionalization of textile materials is the achievement of multifunctionality. There are already many examples of obtained simultaneous flammability and improved other custom properties as colour, antibacterial properties, self-cleaning ability, etc.

Keywords: non-flammable textile, flame retardants, polymer nanocomposite

Acknowledgements:

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ELECTROSPINNING USING AN ORIGINAL "4 IN 1" COLLECTOR

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Introduction The conventional electrospinning set-up by using static collector enables the preparation of only randomly oriented and isotropic structures in the form of a non-woven textile because of the chaotic and whipping movement of the electrospinning jet. To overcome this limitation of the electrospinning set-up, different devices and modifications of the set-up that yield fibrous materials with defined and oriented structure and functionality have been developed. In most cases, their construction is aimed at modifying the jet movement by controlling the electric field distribution. Subsequently, the rotating drum collector has been additionally modified; as a result rotating "string" and "blade" drum collectors have been constructed. In these cases, highly aligned fibers in the gaps between the strings or blades have been collected. The aim of the present study is to create a rotating drum collector that combines all of these modifications in one.

Experimental part The novel, optimized and highly efficient "4 in 1" collector was designed, constructed and put into operation to the available in the LBAP-IP-BAS electrospinning set-up by applying non-conventional and innovative approaches.

Results The originally designed rotating drum collector that combines function of four types of collectors - conventional (smooth aluminium sheet), blade (steel), string (steel) and grid (steel), were successfully constructed and put into operation. The design of the collector allows easily configuration in these four types thus enabling fast and effective fabrication of micro- and nanofibers with tailored alignment and patterned structure. Furthermore, the developed collector broadened significantly the electrospinning capabilities and enabled the preparation of diverse in design non-woven textiles.

Discussion The special construction of the carrying rings allows the aluminium sheet to be easily replaced by blades. Moreover, this construction allows the blades to be easily replaced by strings, as well the strings to be easily replaced by grid. The new "4 in 1" rotating drum collector was successfully tested for the preparation of a series of electrospun non-woven materials from aligned poly(3-hydroxybutyrate) fibers with patterned architecture. In this way, the effect of the collector design and the fibers alignment degree on the mechanical properties of polymer non-woven textile might be easily studied and evaluated.

Conclusion It was shown that combining functions of four types of collectors - conventional (smooth aluminium sheet), blade (steel), string (steel), and grid (steel), an original "4 in 1" rotating drum collector was successfully designed, constructed and put into operation. The special construction that includes carrying rings allows facile replacement of aluminium sheet with blades, strings or grid. This original collector provides deeper insight into the electrospinning set-up and constitutes a good basis for transfer of the developed innovative approach for preparation of patterned textile from laboratory to industrial scale.

Keywords: electrospinning, "4 in 1" rotating drum collector, poly(3-hydroxybutyrate)

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FLAME RETARDANT FINISH FOR COTTON AND COTTON BLEND FABRICS

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Abstract

Cotton is the one of the most important textile fibre because of its comfort and worldwide consumption. However, it ignites easily and is frequently implicated in fire. Since, considerable efforts have been made to develop flame-retardant cotton. The flame-retardant cotton fabrics must be durable to washing cycles, eco-friendly and have a good physical mechanical properties. This article summarizes an overview of the factors related to the requirements of flame retardant cotton fabrics such as chemical agents and technological parameters.

This section also introduces some of the new chemicals and techniques used in the fire retardant treatment for cotton fabric. They allow flame retardant treated fabrics to have more durable fire resistance and better mechanical properties while still being environmentally friendly.

In the 2 and 3 sections of this article, the experimental results of study on flame retardant treatment for cotton and cotton polyester blend fabrics of the authors are presented. The experimental results show that flame retardant cotton and cotton polyester blend fabrics, which was received from this research have a good flame retardancy, but it has limited durability to wash, moreover, after treatment, mechanical strength of fabric was reduced. In order to have the durable flame retardant, eco-friendly cotton fabric, the study should be continued in the direction of using environmentally friendly chemicals and in treatment process, it should avoid the conditions that may adversely affect the mechanical strength of the fabric. Plasma application in flame retardant treatment of fabric may be a good solution to could meet all requirements of fabric.

Keywords: Cotton fabric, cotton polyester blend fabric, flame retardant agent, cross-link agent, Organophosphorus flam retardant agent.



Topic № 2
TEXTILE TECHNOLOGIES:
SPINNING, WEAVING
AND KNITTING



EVOLUTION OF KNITTED MACHINES

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ABSTRACT

The development of knitting machines goes hand in hand with the implementation and use by humans of various knitting structures. As the knitting technique develops, it becomes more productive and allows knitting of more complex structures. Production becomes more flexible, and for a very short time, it passes from producing one item to another.

The beginning of the knitting machine was given in 1589 from William Li. His machine knits with spring-bearded needles with a productivity of about 100 loop rows per minute. In hand knitting, the productivity is barely 120-150 stitches per minute. Today's circular knitting machines fitted with a large number of knitting systems (for example 50) and moving at a speed of 20 rpm may be up to 2000000 stitches per minute, depending on the number of needles in the cylinder. If we go back 20 years, the maximum production of a knitting machine was 300 Kg per day, and today it reaches 1500 Kg per day.

This is why the actual study represents the overall development of knitting machines and modern innovations in this field. The most important discoveries in the development of knitting machines are given in tabular form, including those earlier in the centuries after 1589, as well as recent achievements.

Throughout the development, the main goal was to increase the productivity of the machines and the ability to knit as much as possible a variety of knitted structures.

In tabular form is given the time and place of the various discoveries in the development of knitting technique. The name of the discoverer is also given. Other authors also made such a presentation of the history of the knitting machine. In the present work, the information is broader and up-to-date.

From the analysis of the evolution of the knitting machine, it is also noticed that by adding additional accessories to existing knitting machines, it is intended to apply different techniques to the shaping of knitting. This, however, at this stage leads to the complication and cost of knitting machines without substantial production becoming more efficient. On the contrary, productivity is declining significantly. This means that science and technology still fail to effectively apply these techniques to industrial production.

In this connection, new solutions must be sought. It is necessary to change the basic philosophy of knitting. New loop-forming methods must be sought to provide free space knitting, organs to intertwine the threads effectively and form the bulk shapes of the human figure. It is wrong to go for this purpose from the existing knitting machines that have already played their part and were mainly designed for knitting knitwear. For the production of 3-D knits (whole garments), all-new robotic knitting machines are needed. It has to be assumed that traditional knitting with knitting needles is at the end and looking for alternatives to knitting needles (water or air jet, etc.). The loop-forming element must be variable in size, receive variable velocity and trajectory in the space. Being able to act in the area of a loop, a group of loops or the whole bunch of loops.

Another prospect for knitters' manufacturers to be involved is a flow robotic line that provides a complete knitting of knit garments. This prospect preserves traditional knitting techniques and technologies and provides effective knitting of whole garments. Separate pieces are knit from various knitting machines in a line, and finally they are knit together to form the finished article.

Keywords: Knitting Machine, Evolution, History

EXPERIMENTAL STUDY OF THE FRACTION COEFFICIENT OF SLIDING FOR COTTON TEXTILE GARMENTS

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Abstract

1. Introduction

In this hereby study; friction coefficients of sliding of twill wave 3/1 and plain weave have been determined experimentally. In the process of cutting and sewing, friction has an effect on the quality of the finished product due to the non-displacement of the layers of fabrics [1, 2]. The hereby study focuses on the correlation between load applied to the friction and the increasing actual contact area of friction surfaces.

2. Experimental part

The hereby tests have been ran using the MXD-02 Coefficient of Friction Tester, produced by Labthink, China, and by standard BDS EN ISO 8295:2006. The friction study is conducted fabric to fabric, in different directions of the fabric, on the face side of the two layers, with different loading of the tester's sleeve - 200, 300 and 400 gr and with a constant slide speed of 100 mm / min.

The studies fabrics are twill weave 3/1 and linden weave cotton woven fabrics, which differ in linear density, concentration and specific surface area.

3. Results and a Discussion

The conducted research shows the effect of the pressure on the friction characteristics of fabrics of the same composition but with different thickness of the warp and weft threads. The different values of the friction characteristics depend on the change in the contact area, which varies in different directions. The actual contact area increases as the pressure increases, resulting in an increase in friction coefficient of sliding. The friction coefficient of sliding is highest in twill weave 3/1 and for plain weave; it is in warp direction for the first layer and in the direction of the weft for the second layer. This is due to an increase in the actual contact area for the two layers [5].

4. Conclusion

The results obtained through these studies can be characterised as scientifically applicable. They can be applied in power sizing of textile machines. The results obtained can be used when tuning sewing, cutting, etc. machines, used in the textile industry when working with cotton fabrics, as the main purpose is avoid displacement of individual layers during work. In addition, the results can be used to determine the friction characteristics of fabrics - friction factor, friction index, and friction parameter.

Keywords: friction, cotton fabrics, drag coefficient of drag.

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UDC677

INITIAL ANALYSIS OF HAND-WOVEN SAMPLES OF BROAD CLOTH AND FRIEZE

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For a long time, from the beginning of the 19th to the mid-20th century, two woollen woven fabrics are the backbone of the textile production in Bulgaria. These are the broad cloth and the frieze, which are roughly the same in terms of home crafts, municipal manufactory and industrial weaving. Both articles are made from local wool raw materials on the woollen or carded system of spinning.

The differences between the broad cloth and the frieze begin with their purpose. Broad cloths have a surface weight of 250 to 400 g/m² and are designed for upper ladies and men's garments: low-cut sleeveless dress, suits and military uniforms. Friezes have a surface weight of 600 to 1000 g/m² and are designed for men's outerwear: cloaks, mantles, ears and great coats.

Substantial divergences between the two fabrics are due to the qualities of the wool raw materials used, the linear density of the weaving yarns and the finishing treatment of the raw fabrics. Woollen yarns for broad cloths have a linear density of about 70-75 tex, while yarns for friezes cover a significantly larger range from 200 to 500 tex. Usual weave for both fabrics is plain weave, but samples of twill are found - 2/1, 3/1, and 2/2.

Divergences in the construction, appearance and consumers properties of the broad cloth and the frieze are mainly due to the finishing of the raw fabric. As long as the broad cloth is washed and pressed in addition to washing, the frieze is subjected to intense and prolonged tightening.



The main problem for the preservation and reproduction of these authentic Bulgarian craft fabrics in their original form is the lack of in-depth research and technological documentation on the conditions of their manufacturing. Subject of this paper is the parameters of the fibre composition, construction and consumer properties of the broad cloth and the frieze. Aim of the development is to establish the technical conditions for the production of the known modifications of the broad cloth and the frieze. Performance tasks include literary research, collection of samples of domestic or industrial origin, analysis of the fabrics and compilation of technological documentation.

Acknowledgments

The authors thank E. Miroglia EAD - Sliven for the support and assistance in the performance of the graduate work at the College - Sliven of the Technical University - Sofia and presentation of the results of the National Textile Conference in 2018.

Keywords: textile craft, broad cloth, frieze, woollen yarns.

UDC677

ARTISTIC DESIGN AND PRODUCTION OF JACQUARD EMBLEM

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Introduction

The jacquard emblem, as a final product, is originally formed as an idea, design or sketch by the textile artist - designer.

Jacquard weave is a complex process requiring technical knowledge and creative skills. Knowledge of color science, color harmony and ornamental composition is required. The textile artist must know the laws of interwoven thread, fabrication of tissues structure, composition and type of yarns.

Purpose of the study - Following the steps in the artistic design of the jacquard threat.

Automated design with CAD system and fabrication of the jacquard emblem - Coat of Arms of the Republic of Bulgaria, the artwork of which has been produced through the softwer product MUCAD - Passementerie, ISKRA LTD, Parvomay town.

Experimental part

Jacquard lancet tissue is a single tissue on which is placed a second system of basic or weft threads, called lancets, that float on the packed side of the fabric and go out on the face according to the figure. Teh fabric has a weighted view on both sides. The base is hardly visible. Her density is less than weft.



Keywords: jacquard, artistic layout, Emblem of Republic of Bulgaria, insignia.

Conclusion

The analysis confirms the correctness of the methodology, used to design the fabrics. In conclusion, the present work can be successfully used to design new assortments of jacquard fabrics.

Topic № 3

APPAREL

TECHNOLOGY



A DESIGN AND TECHNOLOGY FOR PRODUCTION OF EMBROIDERY FOR CHILDREN'S CLOTHING

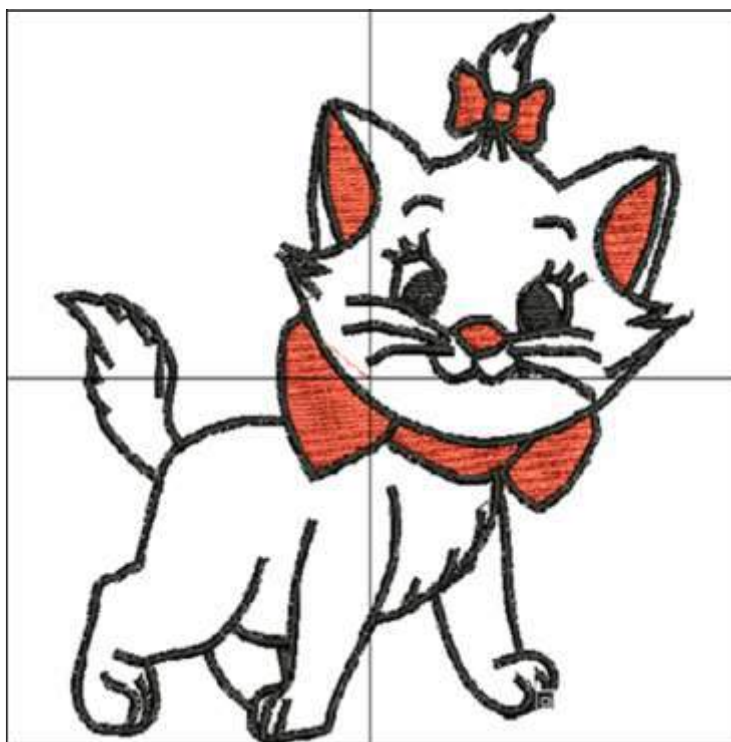
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Abstract

The machine embroidering is often used to decorate clothing. The sector is constantly developing with the improvement of embroidery machines, introducing new features and technologies for embroidery production. Besides standard embroidery three-dimensional embroidery can be produced by applying different types of supporting materials such as polyurethane foam, wadding, rigid plastic materials or by sewing strips, cords, sequins etc.

The purpose of present work is to develop a design and technology for production of machine embroidery, intended for children's clothing. Before proceeding to a new embroidery design it is necessary to develop a production technology that includes several basic steps: drawing, scanning (by hand-painted designs), processing, digitizing, embroidering, inspection for defects, corrections (when is necessary), re-embroidering and finishing. The designs in the thesis are original works inspired by cartoons and they are hand-painted with a marker pens. After image scanning a graphics program processing is done to smooth contour lines and reduce colors. This facilitates the digitization process of images, which can be done manually or automatically. 6 of 12 designs, digitized with specialized embroidery CAD software (Digitizer MB), are embroidered on one-



head embroidery machine Janome MB 4 with four needles, available in the Textile Department. Half of the designs are made for woven and the others for knitted fabrics. Contour embroidery is recommended when using knitted fabrics, avoiding filled objects. An appropriate technique is the applique, where the design is not aggravated by many stitches, but at the same time can be achieved interesting color solutions. Two types of embroidery are produced on the woven structure: standard and three-dimensional with the application of additional support material as polyurethane foam.

Finally, the factors involved in forming the cost of embroidery are defined. From the made calculations, it can be seen that the most costly factor is the personnel cost.

Keywords: design, technology, machine embroidery, children's wear.

UDC687

DEVELOPMENT OF TECHNOLOGY AND ORGANIZATION FOR PRODUCTION OF PROTECTIVE CLOTHING

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Introduction

Protective clothing covers a major share of PPE worldwide and plays a key role in ensuring worker safety in the industry. The protection of worker's life and health is of great importance, and led to the development of specific standards, which set requirements for its qualitative performance. They include general requirements for clothing and its construction, minimum levels of materials' characteristics, as well as test methods for determination of their properties.

The aim of the work is to develop a technology and an organization for production of protective clothing (jacket, trousers and overalls).

Experimental part

The experimental part includes the implementation of the following tasks:

1. Selection of materials that meet the European requirements for this class of clothing.
2. Patterns making and technical description of the models.
3. Development of a technology for their production.
4. Selection of appropriate machinery and equipment.
5. Performing technological calculations to determine the number of machines and workers.
6. Organization of the production in terms of time and space.
7. Organization of the quality control.
8. Calculation of the production costs, products' price, loan amount and period for repayment.



Results

Technology and organization for production of protective clothing for work in high temperature environment have been developed. The proposed solutions are implemented in Galtex 2006 Ltd. For fabrication of the garments Nomex III A fabrics by DuPont will be used.

A production program of 165,600 protective clothing per year has been set up. The purchase of new heavy-duty sewing machines Juki is planned.

The enterprise structure includes: modeling section, cutting section, sewing section, finishing department, power engineering department and supply department. A floor plan has been developed in compliance with all technological and regulatory requirements in terms of distance between walls and machinery.

Conclusion

The investment is BGN 1,000,000 with a return on investment of 5 years. Calculations that prove the competitiveness of the enterprise have been made.

The high cost of materials and the requirements for protective clothing require excellent production and quality organization.

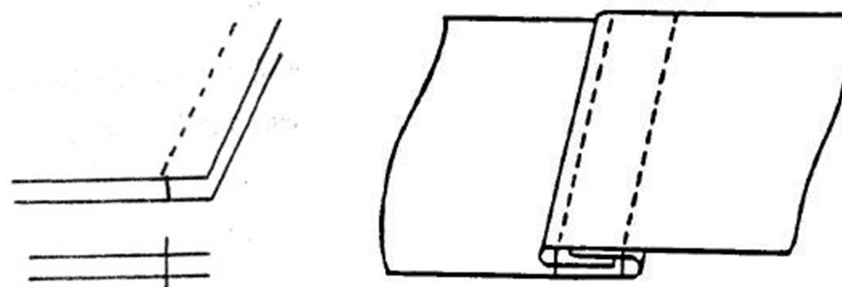
Keywords: PPE, protective clothing for work in high temperature environment, production technology and organization

THE INFLUENCE OF GARMENT DYEING ON SEAM PERFORMANCE

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ABSTRACT: Garment dyeing offers flexibility in differentiation the winning seasonal colors in apparel supply chain, lowers production costs and reduces inventory. During the dyeing process, the garment is exposed to mechanical and chemical action, which leads to a change of particular garment properties, possible occurrences of defects and decreasing of quality. A range of fabric samples for shirts and trousers were exposed to garment dyeing treatment using two different dyeing procedures: dyeing with reactive and dyeing with pigment dyes. Two types of seams were applied for seaming the cutting parts: superimposed and lapped seam. The influence of the garment dyeing treatment type on seam performance was investigated. The results show that the decreasing of seam strength of reactive dyed garments is greater than the pigment dyed one. The average seam strength decreasing for both investigates seams types is 14.6% for reactive dyed and 5.9% for pigment-dyed garments. Comparison of seam failure mechanism showed difference between referential and garment dyed samples.



Clothing has always been a permanent part of human living and culture. The garment industry features a variety of fashion products to satisfy specific market demand. Because the today apparel market is regarded highly competitive, the apparel companies in striving to remain competitive on the market relay manly on the issues generally connected to quality and innovation and not merely on squeezing prices. Within this aspect, the features of row materials, garment performances and quality become very important.

In general, the garment is manufactured from previously coloured materials. The quantities of dye for certain product are purchased before the dyeing process which negatively impact supply chain management and quick response to market demands.

Today, when the lead-time to the market is essential for positioning and success, manufacturers frequently employ the colouring of readymade garment. In order to differentiate winning season colours, it is possible to react much more efficiently towards market demands if the garment is coloured after manufacturing. This includes the manufacturing of garment from uncoloured materials and trims and colouring after manufacturing.

For successful accomplishment of readymade garment colouring process, the particular attention should be devoted to issues such as readymade garment preparation for colouring, materials shrinkage during the wet processing, the selection of sewing threads, linings, interlinings and other trims.

The objective of the paper is further investigation of properties of seam after readymade garment dyeing with reactive and pigment dyes.

Keywords: readymade garment dyeing, seam, seam class, reactive dyes, pigment dyes

UDC687

DESIGN AND CONSTRUCTION OF A COLLECTION OF CHILDREN'S CLOTHING FOR GIRLS

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Introduction

In the beginning of the 21st century, children's clothing was devoted to the independent industry. It does not copy adult clothing but is influenced by adult fashion. It has greater possibilities for free-to-fit the individual parts. According to current fashion influences, the silhouette, volume, colors and fabrics change. Priority is given to materials: ecological and lightweight, heat-resistant. In shape and proportions, children's clothing differs too much from adult clothing.

Experimental part

An authored collection is available for girls from the third age group, 10-11 years, for the spring-summer season. The collection consists of 10 varied and attractive models for different occasions and occasions from everyday life. The silhouettes are smooth, free and do not restrict movement. The colors are up-to-date for the season and the fabrics are cotton, knitwear, satin cotton and other natural fabrics.

The modeling of 5 of the models was made on the basis of predefined basic constructions of: a children's dress in a dental and semi-obtuse silhouette, a pants, a half-skirt. The main constructions are built according to the Muller & Soon standard sizes 146-73 according to BDS EN 13402-3: 2004.

Results

All construction drawings are executed with AutoCAD 2015 software. Technical drawings in the face and back, technical descriptions, constructive drawings of model development for all elements, drawings of the main details and work templates were developed to the models.

Conclusion

Children's clothing such as for adults is subject to fashion trends and changes every season. Kid's fashion is oriented towards the child's image and life, and to the spheres of his activity. The models presented in the designer collection can serve small ladies both in their daily routine and on official occasions.

Keywords: Collection, clothing, girls, fashion design, construction.



INVESTIGATION OF THE STRETCHING FORCE OF THE NEEDLE'S THREAD IN THE WORK WITH MULTILAYER WEAVE

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Abstract

1. Introduction

The paper deals with stretching force of the needle's thread in sewing industries. The stretching force of the needle's thread is one of the main factors determining the quality and performance of the sewing process. This factor depends on a number of technological parameters. The influence of some of these technological parameters on the tensile strength of the needle thread has already been investigated. For example, the subject of research and analysis was the influence of surface mass of processed textile materials [1], the number of layers processed [1]; the technical devices used [2] and others. There have been studies of the stretching force of the needle's thread of different composition textile materials - wave [1] and a wool-type textile material of cotton and cotton-type textile materials [2] and others. Each of the above studies was conducted for single layer weave. The wide variety of textile materials and the emergence of more and more new ones requires continuous experimentation to determine the nature of the stretching force of the needle's thread for textile materials of different structure. For example, a tissue - a multilayer weave type "double cloth" have become more and more used in the sewing industry in recent years and this motivates the present study.

The aim of this paper is to investigate the nature of the stretching force of the needle's thread when working with a tissue - a multilayer weave type "double cloth".

2. Experimental part

The experiments were performed with tissue - a multilayer weave type "double cloth". The front fabric is 100% cotton and the lower fabric is 100% wool. The intermediate layer is made of chemical silks - polyamide and viscous.

Research has been conducted with a computer-integrated measuring system to determine the thread's tension force [3].

3. Results and a Discussion

The nature of the stretching force of the needle's thread has been determined under dynamic conditions of fabrication of a tissue - a multilayer weave type "double cloth".

4. Conclusion

The results are scientifically - applied character and can be used in making fast and accurate decisions in response to specific technological problems. For example, the results obtained can be used for high-precision tuning of sewing machines when working with specific types of textile materials.

Keywords: stretching force of the needle's thread; multilayer weave; sewing companies

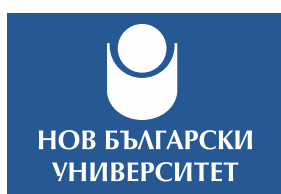
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Topic № 4
TEXTILE ART
AND FASHION DESIGN



THE PROCESS OF CULTURIZING

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In Bulgarian language the word 'culture' comes from the latin cultura or colo/colere and means education, development, cultivation, preservation.

The process of culturizing is the foundation of human kind's development and is a sign of a community's evolution. It's an act of recognition and inclusion of the unknown and also, is always an act of overcoming of the opposition: nature - culture. Therefore, namely this act results in favour of man and his daily life.



Regarding textile, this process is being manifested through the transition of a wild, natural product into a ductile, able to be treated material, from which to be produced a completed handiwork - thread, fabric, cloth. First, there must be found an object from the surrounding environment which needs to pass through the process of almost complete destruction. Then, comes the next step: the process of creating something new - derivative.

Symbolically, the culturizing itself personifies (manifests) our ancestors' view over the eternal life of the Soul whose aim is to become more developed and clean with each next reincarnation. Same is the principle of the culturizing itself, namely: life-death-life.

In my work "In the beginning was the Word" I represent the relation between the cultural inheritance and the evolution which actually originates from the will of the past. My work is an eight meter-long fabric with the word Bulgaria written in Glagolitsa alphabet. It carries the spirit of the past through the use of not entirely treated textile materials and through our old alphabet that is no longer used in Bulgaria. Later, this process reached a point where this fabric was deformed and then transformed/turned into clothes. Namely this is the process of culturizing - bringing to life a piece of a past era.

Keywords: culture, culturizing, process, textile, fabric.

UDC745/749

DESIGN AND PRODUCING A LAMP BASE

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Introduction

The diploma thesis aims to encompass the entire design conception and to produce a lamp base considered to the user's wishes and needs.

In the development are presented the main stages of lamp design, as well as some basic concepts in the industrial design. In the process of designing the basic elements, the designer recreates the user's desires and the qualities of the product elements. The types of light, the light sources, and how they affect human perception are explored.

Research

In order to achieve the stated goal of the diploma, the following tasks have been set and implemented:

A study that resulted in the problems associated with the conceptual design being cleared.

Choosing a pyramidal shape of the luminaire, symbolism of shape and durability.

Designing the model and photorealistic visualization of the luminaire by selecting the right 3D software.

Selection of suitable materials for the real production of the lighting model.

Select appropriate colours and luminaire for the project.

Results

The balance between the creative impulse of the world and the designer's personal opinion is the key to achieve the optimal effect of the creative process in designing the model. The luminaire is handmade with precision to the detail and its own personal story.

Discussion

The diploma thesis can be applied as part of textile art. The diploma project includes textile fiber, wood and LED strip.

Conclusion

"Although all students have their own unique skills and ways of thinking, similar to that of a gemstone, these individual intellectual assets need to first be dug up and polished before the student is able to wholly realize his or her full potential" - John Berger.

Keywords: industrial design, lamp design



ELSA SCHIAPARELLI'S CREATING DESIGN AS AN AESTHETIC IMPULSE FOR MODERN FASHION INTERPRETATION

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The scientific report analyzes key moments from Elza Schiaparelli's innovative fashion design in the context of the fashion phenomenon, perceived as art. Direct and indirect implications have been sought between her work on the one hand and the motives and ideas of such iconic artists in the twentieth century, such as Salvador Dali, Jean Cocteau and René Magritte. An attempt has been made to systematize the unique techniques of Schiaparelli. The conclusions correspond to the general contributions of a designer to the concept of fashion as art and the aesthetic, cultural and artistic value of fashion design. There is a need for bridges between the arts leading to the enrichment.

Keywords: fashion design, fashion, art, aesthetics, culture, surrealism, innovation, Elsa Schiaparelli, Salvador Dali, Jean Cocteau, René Magritte

TEXTILE AND SUSTAINABLE MODELS IN THE DESIGN OF CHILDREN'S ENVIRONMENT

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For centuries, textile is one of the most preferred materials when it comes to the making of children's environment. There is a variety of technological possibilities for manufacturing of textile materials and their coloring. Textile has become one of the most applicable and distributed materials in the physical environment for children of all ages with its various methods of construction and fabrication of textile products as well as with the means for realization of multiple shaping and plastic volumetric structures. The variety of possibilities which affect through structure, shape, color, pattern and tactile sensations is with an extremely wide range. In addition, textiles provide prerequisites for complete satisfaction of children's needs by building a safe environment that is conducive to their health, perceptions and psyche.

After a period of mass penetration into the industrial textiles production made of synthetic fabrics and artificial dyes, now the tendencies are directed to the revival of natural origin materials. The demand for raw materials and technologies, linked to sustainable models of extraction, design, production, consumption and waste utilization, is becoming more and more explicit.

Designing for children is one of the areas where the aim of achieving sustainability is particularly justified. There is hardly any other target group that can derive greater and immediate benefit from sustainable design, both in the short and long term. The sustainable use of textiles contributes not only to the development of a child-friendly environment but also creates prerequisites for shaping their emotional, aesthetic and behavioral upbringing in the direction of ecologically and sustainable models establishment.



Keywords: textile design, sustainable design, children's environment.

HI-TECH DESIGN IN THE CONTEXT OF SOCIAL NETWORKS

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Докладът разглежда успешната колаборация между високите технологии и модата. Направен е обзор на футуристично звучащи модни артикули, които са уникални по своя дизайн, функция, предназначение и употреба с цел да се представят водещи тенденции, прогнози и перспективи пред съвременната мода. Разгледано е комбинирането и миксирането на нанотехнологиите с най-новите творения на модния дизайн, което води до създаването на иновативни и провокативни прототипи. Направен е опит да се презентират модни произведения от умни материали с интердисциплинарен характер. Отделено е внимание и на динамиката в комуникацията - още един важен аспект на високотехнологичния моден дизайн, улесняващ общуването ни чрез социалните мрежи. Специален акцент е поставен и върху поп-ъп магазините, като постмодерна иновативна бизнес стратегия, чрез която модните брандове достигат своите потребители по-бързо и ефективно.

Ключови думи: моден дизайн, хайтек дизайн, смарт текстили, високи технологии, социални мрежи, футуризм, нанотехнологии, поп-ъп магазин

TEXTILE MATERIALS AS PLASTIC FACILITY IN SCULPTURE OF SPACE FORMS OF DIFFERENT SIZE FORMAT. NATURE AND IMPACT

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Abstract: The use of fabrics with a high content of Lycra in the textile industry makes the fabric highly stretchable and elastic. This quality makes them variable and unpredictable under the influence of the applied force.

The interesting thing in the presented workmanship in the current work is the unique approach of the author; the result is built specific manners, achievements and attached in a variety of creative directions. The uniqueness is manifested in each stage of the work throughout the process. The textile materials from which were made mainly by textile sculpture is a simple cotton fabric that does not have the plastic qualities of fabric with elastane. The plastic is a result from the characteristic of modelling.

Keywords: Volume, shape, matter, plastic, small sculpture, sculptural shape, scenic approach, textiles, composition, construction, internal and external balance.

ИЗКУСТВОТО НА КОНСТРУИРАНЕТО И НЕГОВАТА РОЛЯ ВЪВ ФОРМОИЗГРАЖДАНЕТО НА ОБЛЕКЛОТО

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Когато говорим за формоизграждане на облеклото, един от аспектите, които следва да бъдат разгледани, е процесът на създаване на конструкцията на дрехата. Основната цел на този процес е постигането на оптималната форма, която първо, да бъде подчинена на дизайнерската идея за обем, силует, пропорции и функционалност, и второ, да бъде съобразена с фигурата, формите и пропорциите на този, който ще носи дрехата, така че тя да приляга добре на тялото.

Доброто прилягане на облеклото е нещо, което засяга както хората, заети в модната индустрия, така и потребителите. Това е един от най-важните елементи за привлекателността и продаваемостта на една дреха, наред с дизайна, материята, цената.

Първите облекла, които човекът започва да носи, са животинските кожи, грубо съшити една за друга и обвити около тялото. Това означава, че плоското парче материал, каквато е кожата, е стартовата точка за създаването на една дреха, което трябва да обгърне една обемна (триизмерна) форма, каквато е човешката фигура. По-късно, с появата и развитието на преденето и тъкането започват да се използват ленени, копринени и вълнени тъкани за направата на облекла. Парчетата плат, директно свалени от стана (без да бъдат нарязвани или скроявани по някакъв начин), биват драпирани върху тялото, закрепвани и поддържани на мястото им посредством пояси, декоративни брошки или клипсове. Първите дрехи, които били скроени така, че да прилягат към тялото и крайниците чрез ръкави и крачоли, се появяват по времето на Минойската цивилизация. Тогава се заражда и кройческото изкуство или **изкуството на конструирането**.

Предмет на настоящето изследване е еволюцията в изкуството на конструирането на облеклото - от създаването на първите дрехи, направени от животинска кожа, до използването на най-новите компютърни технологии за триизмерно проектиране и принтиране. Проучването проследява развитието на конструирането на облекло в периода от XVI до XXI век.



Figure 1 3D проектиране на облекло.

Ляво: симулация на дреха, облечена върху виртуалния манекен на "Marvelous".

Дясно: двуизмерната конструкция на същата дреха.

Keywords: information systems, technologies, fashion industry, CAD/CAM, integrated production.

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FASHION INSPIRED BY CONTEMPORARY ART

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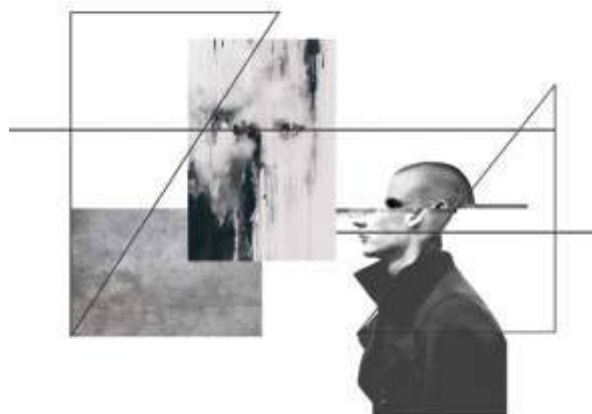
IGHIGONI152

The traditional Japanese Zen philosophy is a source of inspiration for the clean style of minimalist architects. The main elements that characterize their work are line, form, space and material. I find Japanese architecture extremely fascinating because of all of the incredible pieces of art that it creates. That is the reason why the collection ICHIGONI 152 is inspired by it. Contemporary Japanese architecture is characterized by one of a kind innovative projects. These are perfectly balanced and exceptionally harmonic buildings that combine tradition and modern spirit. They are extremely functional and practical but by no means lacking beauty and charm. Some contemporary architects, such as Tadao Ando for example, are famous for their combination of traditional Japanese and Western architectural movements.

Tadao Ando is a well-known Japanese architect, whose approach to architecture and landscape was categorized by the architectural historian Francesco Dal as "critical regionalism". Ando does not have any specialized architectural education. He had been a truck driver and a boxer. During his second year at high school he goes to Tokyo where he sees a building of Frank Lloyd Wright. It impresses him so much that he decides to ditch boxing after high school and focus on architecture. Ando rises in Japan where religion and lifestyle strongly affect his work in architecture and design.

Tadao Ando's architectural style is connected to the "haiku" effect, emphasizing emptiness and void spaces in order to present the beauty of simplicity. He prefers to design complicated space circulations and to maintain the cleanness of the facade by using the qualities of exposed concrete as a material. The Zen influences that are focused of the concept of simplicity and concentrated on the inner world rather than the outside appearance are strongly emphasized in Ando's work and become his distinctive mark. Because of the plainness of the exterior the construction and layout of the space have a potential to present the aesthetics of feeling. Ando also stresses the relationship between architecture and nature. He believes that architecture is responsible for recreating the spirit of the place and makes it visible. Tadao Ando follows precisely the Japanese tradition: the preservation of the environment has always been an important part of Japanese architecture.

Keywords: sustainable fashion, contemporary art, minimal, architecture, nature, Japanese style, Zen influences, peace of mind



RESEARCH OF THE RELATIONSHIP BETWEEN THE SHAPE OF THE HUMAN BODY AND THE DESIGN OF CLOTHING

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Introduction

The personal style of dressing is paramount in human communication. Through the clothing, the personal image is built on a daily basis, a message is sent to the others. Your own styling can create every person with a taste for the beautiful.

Experimental part

The shape of the human body is analyzed in the design of the individual's clothing, and the effect of a hourglass (the width of the shoulder is equal to the width along the hips as in the harmoniously developed figures) is visually sought out through the clothing. For a standard figure, $\text{hip} = (100 \div 106)\% \text{ bust}$ and $\text{waist} = (75 \div 79)\% \text{ bust}$. If $\text{waist} = \text{bust} - (17,8 \div 22,9) \text{ cm}$, a percentage of the waist is calculated for the classification of the figure. If $\text{hip} = \text{bust} + (0 \div 5,1) \text{ cm}$, a hip percentage is calculated for the figure's classification. Here are the following types of human body shapes: straight, pear, spoon, hourglass, inverted triangle, oval.

The most common type of figure is a rectangle (**Figure 1**). Typical for this type of figure is $\text{waist} = (80 \div 90)\% \text{ bust}$. Over 45% of American women have a straight body shape. Typical are a balanced hip and bust, the waist is not clearly outlined. In the area of the seat, the body is flatter. The tendency for fat accumulation is first in the torso and then in the lower thighs and arms. The legs at the bottom are well formed and can be accentuated by clothing.

The silhouette of the clothing should be proportionally voluminous in the upper and lower body, emphasizing the waist. A dress in a rectangular silhouette with a wide dark belt is appropriate. For this type of figure, it is necessary to add visual volume to the upper and lower body. The shoulder items are with accented waist with elastic, belt. One shoulder can be found, the neck is U-shaped or V-shaped, or a "boat", which extends the shoulders and makes the waist look smaller. The sleeves have a set or kimono, bat sleeves. Decorations around the bust and shoulders, frogs, additional volume-enhancing items are applied. The shoulder is free of swollen, swollen and loosely fitting in the chest area. The underwear is padded. The jackets are pocket-sized and breast-embroidering elements to boost the volume in this area.

Conclusion

After analyzing the shape of the human body, three designer clothing solutions have been successfully applied, which optically affects the proportions of the figure and visually brings them closer to those of the normal figure.

Keywords: human body, shape, design, clothing.



Figure 1 Straight body shape and recommended clothing design

CONTROVERSIAL

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"Controversial" is a collection inspired, or rather devoted to the young Chinese poet and photographer Ren Hang. I've been inspired not only by his creativity and works, but also by his personality and life, sadly, life that has ended tragically and prematurely.

He is an author of explosive images and his art is seen as a rebellion against the taboo of nudity and sex in China. The artist has been arrested many times with pornography accusations for his candid photos and his entire career is being conducted in an attempt to be censored by the authorities in his native China. Controversial is a word repeatedly used as a definition for him as a photographer, but I have chosen it as representation of my collection not unambiguously.

The collection is a visual expression of the contradiction between chaos and simplicity, between matter and spirit, the visible and invisible, balancing the threshold between fashion trends and timelessness. Part of the idea is that things are not always what they look like. It is also a reflection of the questions that have arisen in me about the society in which we live, the taboos that we set ourselves, the standards we are trying to answer at all costs and last, but not least, the censorship and the freedom we have or perhaps we don't have, to live and create.

The transparency of the materials I have used on one hand symbolizes this impulse for liberation, freedom and the human right to think and decide for ourselves. On the other hand, it fools the eye, creating an illusion of visibility, but it is only on the surface. Despite nudity, attention is focused on the inner world of man, his intimate world and his mental state.

The colour palette and accessories are directly influenced by his photographs. Colours of the collection are figuratively chosen. The red colour is the colour of fire and blood, life and passion associated with energy and visual power. Black with its heaviness is the denial of light, sinking in sadness, darkness and death. Contrary to the drama of red and black, the nude colour brings peace and hope, symbolizing innocence and purity, the natural state of man.

The silhouettes contradict simple and clean forms without details, at the same time asymmetrical disorder and chaos is created, which I have achieved through a method of cutting called "Free subtraction cutting".

My project recreates and represents the feelings and thoughts invoked in me by the man and artist Ren Hang and aims to attract and inspire open minds who appreciate fashion as a conceptual environment, a motive in telling of a story and sending a message.



Keywords: free cutting, Ren Hang, transparency, asymmetrical, sculptural

MITOLOGIA

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I would like to present you my Bachelor diploma collection "MITOLOGIA" which expresses my interpretation of the ancient Rome mythology. The images of known deities and mythological creatures surrounded by animals, flowers and ornaments build up my compositions. Deep essence and originality are main criteria of my findings. In the myth everything is possible, it is not obeying the laws of logic and disrupts the law of causality. It expresses the past, present and future. All great artists have borrowed in a sense from myths and legends and have praised different heroes and gods. This is what I have done also, following the tradition and twisted it through my own prism. I am leaving my own footprint and contribution which would provoke and affect others. Important motives in my works are the journey to long gone times and distant worlds as well as the connection with nature.



Through them I would like people to get a glimpse and touch of the wonderful world of ancient deities. The collection "MITOLOGIA" is developed into two directions of the program "Textile - art and design" in the National Academy of Arts. In the tendency of Art I represent the textile composition "PANTHEON" filled with digital print. In the tendency of Design I represent author's patterns suitable for the fashion industry as well as interior application. The patterns which I represent do not follow any determined tendencies but are connected with my own fantasy. Everything from the outside world passes through refracted and exaggerated way through my imagination. The collection "MITOLOGIA" is displayed in a material under the format of 15 digital printed scarfs. Two pieces of digitally printed patterns "Tutte Le Teste" and "Carnevale Di Teste" on neoprene, sewn like a lady's skirt and a dress. Through screen printing I represent two pieces of linen fabrics in negative and positive of the pattern "Mascherata" and samples printed manually on cotton fabrics with dark and light basis. One of the fabrics is sewn into male linen shirt.

Keywords: mythology, gods, ornaments, animals, flowers

NEW PROPERTIES AND FINISHING OF MATERIALS

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Through fiber processing and nanotechnology advances today, synthetic materials which have new features and properties, can now be produced. Some are designed to protect the body, others have built-in interactive elements in themselves within them. These are smart textiles that respond or are automatically activated by external stimuli. For the sake of clarity and according to their basic functions, the materials are divided into three types: materials having protective properties; materials having properties for good human existence; smart materials - fashion, intelligent and interactive textiles. The report examines only the first two types of materials, because the theme concerning smart textiles is quite extensive and can be considered separately

The first part of the report presents the materials with protective properties including the **Nomex** brands; **Enka Sun** and **Trevira R** fibers; **Dyenema - Cordira** and **Kevlar** ballistic resistance fibers and the newer **Twaron** steam-aramid fibers. This part also includes fibers treated for resistance under different climatic conditions. These are the developed membrane systems, **Schoeller** comfort temp microcapsulas; **Hollow** fiber, **Therma foat** foam and **Elionex** inflatable yarn; **Morfo-tex** reflective yarn; phosphorescent pigments and **Tactex's** touch-sensitive optic fibers;

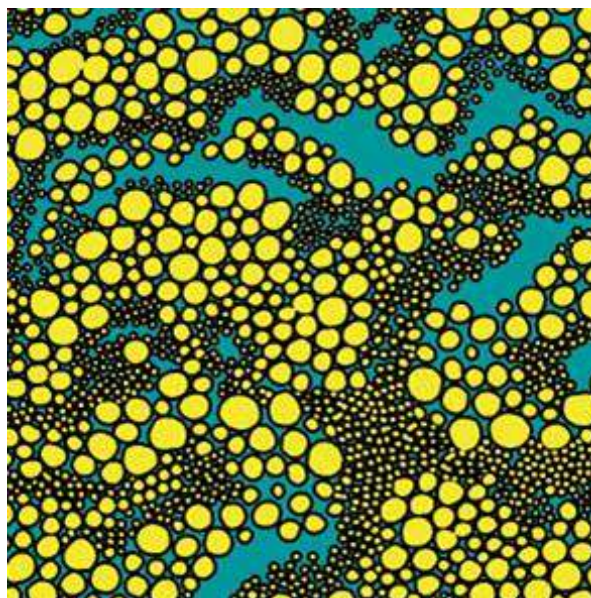
The second part of the report draws attention to materials that have properties related to human health. These are tissues using bio-functional fibers. Presented here are the textile PTFE fabrics and fragrant seals, **Chitopoli** antibacterial fabrics, silver metallic yarns combined with alginate fibers, as well as the **Microban** and **Bio Guard** tissues. **Amicor** fibers and **Permafresh** products, mucus-preventing tissues, the so called "fungicides" - **Accordis**, **Airflow** and **Pertex** tissues are also of interest. In the text, attention is also drawn to **Cupron's** antibacterial technology, as well as to the tissues that absorb and control moisture such as **SAF** and **Dacron** by **Cool Max**, as well as to the newer generations of this type of **Transport Dry Fiber**.

UNTYPICAL

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The collection I have prepared for my graduate work is titled UNTYPICAL. To feel free and happy and enjoying life, we have to live in harmony with ourselves and with the world. In my work I present an atypical harmony with vibrant colours and bright contrasts. It strives for harmony by combining colours and geometric forms capable of provoking different positive associations and emotions.

I was inspired by P. Mondrian's work, his ability with a simple composition to create diversity and the optimism wherewith his work infects others. He impressed me with the fact that he works only with perpendicular black lines and coloured squares and believes in the spiritual power of art. He is convinced that through his works he can change the world, that everything in it is beautiful and full of energy and meaning. Mondrian inspires with his optimism and the ability in the same composition to combine diversity and simplicity.



I have also explored the work of the Memphis Group, an Italian design and architecture group founded in Milan by Ettore Sottsass in 1982, which is known for its non-standard design solutions based on the geometric principle and the pure and bright colours combinations. They are the "culprits" of the overall appearance of America in the 1980s. Sottsass himself says: "Memphis was an entirely new way of thinking. It reflected the dynamics of time, experience, mood and atmosphere of Bob Dylan's distinctive music. The Memphis phenomenon was a window in another world." These words are my inspiration today, also in my entire work. I strive to be the innovator that will give the new vision of the world.

The greatest inspiration I received from the beauty of the botanical garden in Balchik where I managed to "collect" shapes, colours and movements and use them in my work.

Then I created an artistic textile collection containing seventeen basic objects developed in twelve colour combinations. Through observation of nature, followed by stylization and simplicity, I have come to forms that do not carry anything unnecessary in itself, except the most basic characteristic of the objects. I use a variety of graphical programs finishing the compositions and also reports for the different colour combinations. The final products are textiles applicable in interior design, in the fashion industry as well as on different types of ceramics.

SOFT SCULPTURE AND SPACES 1960S TO THE PRESENT (SHORT REVIEW)

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In this report I will try to give a short review of the development, the abstractness and range of **Fiber art**, and in particular of **Soft sculpture** and **textile space installations**, from mid XXth century until now. Adapting ancient techniques and traditional materials, artists working in the field of Fiber Art manipulate gravity, light, color, volume and transparency to demonstrate the endless transformation of the material. Early pioneers like Magdalena Abakanowicz, Sheila Hicks and Lenore Towney lead the revolutionary redefining of Fiber Art and Soft sculpture in the 1960's and 1970's, showing radical abstract forms. All of which is in close connection and is mainly due to the opening of a forum like the **International Textile Art Biennale in Lausanne** in the early 1960's.

The report will present a short introduction of the Lausanne International textile art biennale, pointing out the most influential artists, who contributed to bringing out the textile forms into the space by creating freestanding works.

The report will include an analysis of the deep change from textile, woven on looms, a technique, often connected with the craft, to soft sculptures, which are now put next to the most contemporary movements in art. Provocative research of the concept of softness in art; tracking the beginning of Fiber Art and its predecessor - the **Tapestry**, until it reaches the "**Site-specific**" installations etc.

To support my statement, I will present artists, working in the fields of Soft sculpture and textile space installations today, like Philip Beesley, Yinka Shonibare, Christian Holstad, Alinah Azadeh, Shi Hui, Liang Shao Ji and Maria Nepomuceno - showing their art in prestige forums like:

- Hangzhou Triennial of Fiber Art, China (2013-2016).
- "Fiber: Sculpture 1960-present" exhibition (2014-2015г.) shown in the Institute of Contemporary Art (ICA), Boston.

There will be an emphasis on the following exhibitions from two pioneers of this art, shown in the last two years:

- Magdalena Abakanowicz's exhibition in Central Museum of Textiles in Łódź (Centralne Muzeum Włókiennictwa, Łódź) 2017/18г.
- Sheila Hicks' exhibition in the Cultural Center George Pompidou, Paris - 2018.

By presenting this report, I hope to provoke interest in deeper research of this ancient art, which has succeeded in developing into a new form of art and during the last century, through forums like The Lausanne Biennial (1962-1995), The International Triennial of Tapestry, Łódź (from 1972 to the present), The Biennial Flexible of Tilburg Textile Museum, Holland, The Venetian Biennial (from 30th April 1895 to the present) and many others, still manages to prove itself through its historically strong influence to the global art scene thus rightfully claiming its own place on it now.

Topic № 5

TEXTILE MACHINERY AND EQUIPMENT



DETERMINATION OF CONTROL LIMITS FOR VIBRATION CONTROL OF HARNESS MECHANISM OF WEAVING MACHINES WITH FLEXIBLE RAPIERS

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In this study are defined control limits for the vibrations occurring in the harness mechanism of the loom with flexible rapiers. By using the methods and means of the mathematical statistics are defined upper control values, which serve as information for deterioration in technical condition of the diagnosed mechanism. The presented statistical model for determining the level of the quantitated quantities allows the creation of the diagnostic indicators that are necessary for the introduction of preventive vibration control in the weaving technique.

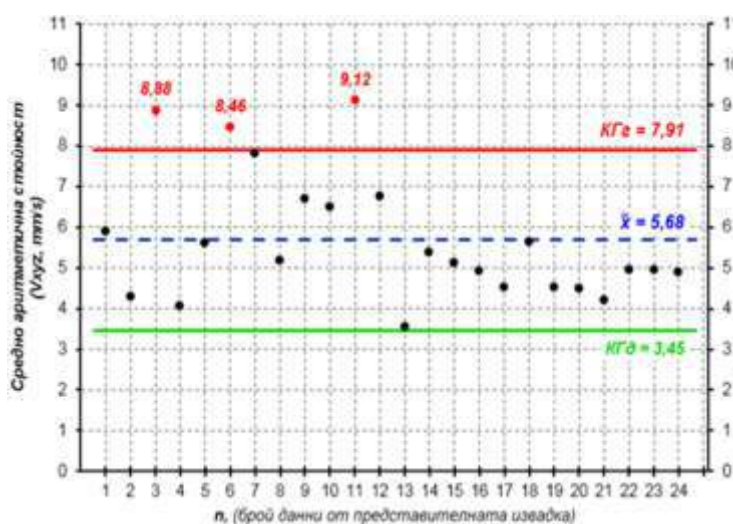
On the base of preliminary, theoretical studies are defined the most loaded kinematic couples, on which are made the measurements of vibrations. For the statistical indicators are use the quantitative parameters of vibration velocity.

On the figure is presented a control card for the mean values of the measured values with upper and lower control limits. It is visible, that some of the mean values do not fall within the confidence interval, i. e they are outside the upper control limit. This indicates, that the mean values (x , y и z) of the measured values (x , y and z), their values are obtained as a result of some violation of the machine mode.

All other values in the confidence interval can serve as an average for the general aggregation with 95% confidence probability.

The specified control limits for the measured value (vibration velocity) establish an allowable value. Upon exceeding the upper limit of control ($KGr = 7,91$) it is assumed that the vibrational behavior of the mechanism will lead to a deterioration in its technical condition.

Keywords: weaving machines, harness mechanism, vibrations, preventive control, vibration control, control limits



Control card for average values
with upper and lower control limits



Topic № 6
TEXTILE MANAGEMENT,
MARKETING AND
SUSTAINABILITY



BUSINESS MODELS IN THE FASHION INDUSTRY FOR TRANSITION TO A CIRCULAR ECONOMY

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Introduction

The fashion industry has turned into a complex, fragmented, global system in the last 3 decades. In its essence, this industry is constantly stimulating consumption of "fashion" and discarding the old things. The emergence of the business model "fast fashion" has increased the introduction of trends leading to the premature end of an existing product's life. This naturally has had a negative impact on the environment and people at the bottom of the supply chain - garment and textile manufacturers. Exhaustion of resources and irreversible environmental changes have provoked a new understanding of efficiency, namely resource efficiency and a regenerative circular economy.

Content

This paper aims to identify and examine opportunities for the fashion industry to adapt to the circular economy. Moreover, it also aims to discuss how different principles of circular economy can be used when identifying and evaluating opportunities related to sustainable development. Theoretically the study rests on the new business models that recently has gained attentions regarding efforts to transition towards a circular economy. By highlighting and extending the idea of business model innovation and new fashion business models for circular economy it concludes with the trends in fashion businesses these days.

Conclusion

Complex social and environmental issues require specific life cycle tools that take into account the environmental impact of a product or process. Conventional methods to address waste, sustainability and resource efficiency are based on symptoms; they do not refer to continuous and rising consumption levels. To do this, we need to: rethink production and consumption; develop sustainable fashion design education; work with customers about the new way of thinking. Design plays a key role in this system change, but fashion industry needs new strategies and business models to help transition to a circular economy.

Keywords: fashion industry, circular economy, business model

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UDC33

MODELLING AND CONTROL OF TEXTILE PRODUCTION PROCESSES BY GENERALISED NETS

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The purpose of this paper is to apply theory of generalized nets for developing a conceptual model for control of textile production processes. The following approaches are proposed: assessment of the technological and ecological characteristics of the processes; detection of wrong/false steps of cloths production and estimation of time stabilization of the processes, applying algorithms for their control.

The main textile production processes include processing of raw materials and garmenting/finishing from fibre to ready-made product; evaluation of machine and labour productivity; evaluation of ecological or social characteristics of processes and products; technologies and quality control of the produced goods.

The control of the textile production is a mandatory procedure, if this production has to be competitive on the domestic and international market. The modelling of processes by generalized nets includes monitoring and control of the status of productions and their environment, as well of raw material sources.

Assessments of the processes on the different production elements have been proposed to be described by the use of generalized nets models, with the use of specialized models for the separate processes, on which the methodology algorithm is based. The model could be used as an element for simulation and control of knitting and sewing production for the purpose of its qualitative and ecological improvement.

This paper offers a proposition of a conceptual model, based on the theory of generalized nets for control of textile production processes in simulative and real conditions for production of different textile goods based on its quality and ecological characteristics, leading to productivity increase.

The concept of the generalised nets is developed by Bulgarian mathematician Attanassov, and based on him the generalised net is based on transitions; their common description is shown on **Figure 1**.

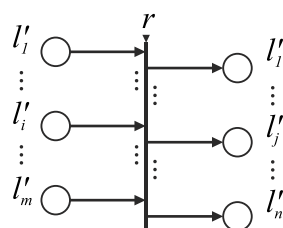


Figure 1

A generalised net consists of transitions $Z = (L', L'', r, \square)$, where $L' = \{l'_1, l'_2, \dots, l'_m\}$ and $L'' = \{l''_1, l''_2, \dots, l''_n\}$ are ending nets with inputs and outputs, and r is a correlation coefficient.

Concrete solutions have been found for describing the assessments of the different productions, which contribute to avoiding the problems of the separate steps- "begin of pipe" principle. This is leading to increasing the competitiveness of goods and enterprises and savings of resources.

The developed conceptual model for modelling and control of textile production processes offers to the Bulgarian specialists a tool for estimation of the production and ecological characteristics of different goods. It suggests targeted interventions in simulated or real conditions before investment decisions, innovations and equipment upgrade according to customers' requirements or the strategy of the textile company.

Keywords: textile, model, generalised nets, control.

UDC33

THE ROLE OF CLUSTERS FOR INNOVATIVE BUSINESS DEVELOPMENT

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Collaboration today has acquired new dimensions, often leading to intensive knowledge flows for creating successful technological or organisational innovations. Globalization, together with rapid technological changes, create uncertainty for businesses. One consequence of this uncertainty is that companies are becoming increasingly dependent on participation in strategic alliances, industrial networks, clusters, and so on. They go beyond the boundaries of organizations as a mechanism for creating new knowledge and innovation as a basis for further competitive advantages. This imposes new working conditions and requires more flexibility in managing, decentralizing and implementing external and internal relationships between different stakeholders.

The present research examines the ways in which innovations originate and spread within the clusters. The subject of the study is knowledge-based clusters and, in particular, the Silk cluster as a cluster practice, with the main focus on the peculiarities of the process "knowledge - innovation - commodity". The literature review provides answers to research issues as: what is the nature of the organizational networks and what are the main drivers for their success? Attention is drawn to the types of networks used in practice, focusing on clusters. Methodological features of the knowledge - innovation - commodity process are summarized by defining phases, dimensions, industrial aspects, prerequisites, and barriers to knowledge-based clustering.

The Bulgarian experience in building clusters is explored in details based on the case of the Textile Cluster Silk. Bulgaria ranked first in Europe and eighth in the world producing raw silk per capita in the years before 1990. Nearly 20 years later, our country came to a complete decline in silversmithing and silkworm, which had become a traditional livelihood. There are many reasons behind this trend, but the main one is that the state has completely turned back on this branch. Thus, Bulgaria became a white spot on the world map for the production of silk. Today, however, with a lot of efforts, enthusiasm, serious investments and modern know-how, Textile Cluster Silk is trying to revive this production.

For the revival of the ever-prospering textile industry in Bulgaria, which by definition provides many jobs, it is necessary to restore the production of textile raw materials - cotton, silk, wool. This idea now has two important allies. The first is the outflow of the world demand of artificial fabrics and their replacement with natural ones. The second is related to special incentives at European level for enhancing the production of the cotton and silkworms in order for the national government to achieve a higher level of diversification of the supply sources of these strategic raw materials.

Keywords: knowledge, innovation based clusters, Textile Cluster Silk.

UDC33

REGIONS OF BULGARIAN TEXTILE CLUSTER SILK



UNLEASHING THE POTENTIAL OF SERVITIZATION IN A SHARING ECONOMY CONTEXT: INSIGHTS FROM THE TEXTILE INDUSTRY

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Services are used in the manufacturing process and in the manufacturing value chain and have an important role in the profitability of the manufacturers. In low tech sector of textiles and clothing the input of business services is an important driver to increase the efficiency and effectiveness of the value chain management and thus been able to meet the challenges of globalization through the management of international supply chains. Additionally, the intensive penetration of disruptive technologies changes traditional manufacturing firms. One of the results of this trend is the slow but steady increase of the share of services in the input of final production of manufacturing companies. Servitisation is a function of the developed abilities of manufacturers to offer services and its development is also associated with the transition from consuming goods to consuming services.

The ecosystem of textile and clothing industry changes as well steadily upon the consumer's more environment friendly and collaborative behavior. This change and the turmoil penetration of digital platforms encourage the development of sharing economy generally functioning through systems of (1) Redistribution of markets; (2) Product Service System; (3) Collaborative Lifestyles Platforms.

The present paper deals on conceptual level with the issue about the crucial role of designers of the PSS in textile and clothing industry to achieve higher performance, significant environmental gains and to provide value in in use to the customer while functioning in the sharing economy. The continuing development of sharing economy calls for the attention of the design community how and what role could the designers play in a changing consumer behavior environment which is more environmentally and social friendly. While exploring the impacts of SE on servitisation the study reveals the role of the stakeholders within the design process of PSS in textile and clothing industry. This research creates a conceptual framework for the mechanisms through which the core systems of functioning of the sharing economy encourage the release of the potential of the servitisation in textile and clothing sector.

The paper reveals that the shift to sharing economy and being servitised create vital relationships between manufacturer in this sector and the clients and thus enhance the client's trust and his loyalty, and boost the innovation processes within the manufacturer. The need of offering of eco-efficient services further enhance the impact of sharing economy on textile production driving manufacturer to add services to their offer and thus unleashing the potential of servitisation.

Keywords: servitisation, sharing economy, design, textile industry, stakeholders

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Topic № 7

INNOVATIONS

IN TEXTILE EDUCATION



IMPACT OF PROFESSIONAL QUALIFICATIONS ON CAREER DEVELOPMENT IN THE TEXTILE INDUSTRY

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Textile production is a special place for personal expression. The manifestation is a result of their own qualifications and the establishment of the right place in the technological flow and the work team. The textile workshop is a highly disciplined public phenomenon, but it is not a barracks. Personal discipline is a consequence of conscious self-improvement. Personal qualification is a result of years of personal efforts and is a combination of broad technical knowledge, special skills and the ability to work incorporation. The problem lies in the public awareness and family orientation of the textile profession, such as education and craft. Textile qualification has no practical application outside the textile production.

The skills and habits necessary for studying the specialties of the spinning production operator and operator in the weaving production are expressed in the following activities. When start spinning a yarn on the spinning machine, it is necessary to learn and adopt some manipulations. In the worsted spinning mill the spinners perform the following manipulations when start-spinning of the yarn: finding the end of the broken yarn on the spool; removing the wound yarn on the drafting roller, stopping the spindle, thread the yarn into the runner, passing the yarn through the thread guides; start-spin: feed with the thumb and forefinger the end of the yarn from the spool to the drawn fibres under the drafting pair and sucked out by the aspiration tube; there is a clinging of the fibres that are start-spinning and spinning process continues. After the yarn has start-spun in front of the drafting device, the next winding and cleaning process continues without returning the spool for re-treatment. In this case, the automatic splicer ties the edges of the yarn and the process continues.

In the weaving process, the manipulations of the weaver are very important during the finding and restoration of the broken warp threads. The weaver pushes his hand over the lamellae of the warp brake and where the warp thread is broken; its lamella falls on the toothed crest and remains stationary relative to the other lamellae. After find it, a textile node recovers the broken warp thread. Area where the warp thread is broken is also important. As with start spinning and weaving, it is very important with what kind of yarns and threads the machines are loaded: whether they are single, twisted or fancy yarns. In the training of students, it is necessary to adopt very well these manipulations to acquire knowledge and skills in the textile profession.

Subject of the paper: Specific knowledge in textile material science, technological flows in textile technology, textile calculations, large empirical data base, machines and processes, machine settings; Hand-crafting skills on start-spinning, start-weaving, weaving knots, machine setup and others; Organizational skills in the logistics of textile production and batch distribution.

Purpose of the development: To analyse and describe the main technical elements of the textile professional qualification; Knowledge about analytical processes and empirical data;

Hand skills; Organizational abilities.

Tasks: literary study, factory observations, observations in the educational system, legal framework, descriptive part, analysis and discussion.

Acknowledgments

The authors thank E. Miroglia EAD - Sliven for the support and assistance in the performance of this work and presentation of the results of the National Textile Conference in 2018.

Keywords: textile education, hand skills, spinning, weaving.

UDC377

CYCLIC PECULIARITIES IN THE LONGITUDINAL DISPLACEMENT OF THE WARP ON HAND HORIZONTAL LOOMS

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The weaving cycle for making a weft involves three basic actions that begin with the opening of the shed, promotion the weft by the shuttle and beating-up the weft to the end of the fabric through the reed brought by the batten.

For industrial weaving machines, the longitudinal displacement of the warp is achieved within the weaving cycle by unwinding the weaving warp and pulling the raw fabric from the work area.

At the hand weaving looms, the longitudinal displacement of the warp threads goes beyond the weaving cycle and follows the possible movement of the batten between the heddle frames and the end of the woven fabric. The maximum stroke of the batten is constructively limited between the heddles and the bearers of the take-up roller at the front end point.



With each beating-up of the next weft, this front end point of the weaver's reed reversing motion is shifting back to the heddles. The reason for this is the overlapping of wefts, one after the other, and the longitudinal immobility of the warp and the fabric in the work area. The main result is the shortening of the base length of shed. Its height remains unchanged and therefore, after each beaten weft the tension in the main threads increases. This changes the conditions of intercrossing and mutual working of the warp and weft threads. From this point of view, hand weaving is not limited by the thread-binding technique but requires additional knowledge and skills on textile materials.

Subject of this paper is the variation in the tension of the warp threads during the weaving on hand horizontal looms. Aim of the work is to establish the analytical relationships between the geometric parameters of the hand looms and the variation of mechanical conditions in the hand weaving. Performance tasks include literary research, technological observation, measuring of constructional proportions and calculations.

Acknowledgments

The authors thank E. Miroglia EAD - Sliven for the support and assistance in the performance of the graduate work at the College - Sliven of the Technical University - Sofia and presentation of the results of the National Textile Conference in 2018.

Keywords: hand weaving loom, textile craft, warp stress, vocational education.

UDC677

TRILATERAL COLLABORATION FOR VOCATIONAL EDUCATION AND ENTREPRENEURSHIP IN APPLIED CRAFTS

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The Municipality of Koprivshitsa implements a project "Development of Social Entrepreneurship in the Municipality of Koprivshitsa" with a partner "Federation of Scientific and Engineering Unions" in Bulgaria.

The implementation of the project aims at the development of social entrepreneurship in the municipality of Koprivshitsa by creating a new social enterprise, which will provide work to people from the vulnerable groups, by creating suitable conditions for their professional integration in the sphere of the social economy. Achieving these goals will contribute to the employment of people in the target group and will positively influence the fight against poverty and social exclusion in the municipality by creating jobs in the new social enterprise.

The main activities of the project include psychological support and motivation of persons from vulnerable groups for inclusion in employment, repair of the available building stock and equipment of the newly created jobs, professional training of the persons. The implementation of the project will solve the main problems of a part of the target group and will be an example that will motivate other representatives of the vulnerable groups from the municipality to participate in the social economy sector.



The enterprise will produce souvenirs, traditional for the city and the region.

Persons, the employment in the enterprise will be assured for, will also undergo a professional training to acquire the professions and specialties required for the activity. The training will be carried out by the project partner - Vocational Training Center of the Federation of Scientific and Engineering Unions in Bulgaria with License № 200312074. The learning process includes the latest achievements in the field of weaving, toys manufacturing, and tailoring. The aim of the training is to promote the practice of lifelong learning for the purpose of professional realization, increasing access to quality education and ensuring equal opportunities, guaranteeing the right to decent work and social integration through employment in Koprivshitsa Municipality. University lecturers conduct the training in the professions: "Operator in textile production", "Tailor" and "Operator in woodworking". To the social enterprise, there will be a sewing and weaving workshop, as well as a joinery workshop for children's toys. As a result of the activity of the newly established social enterprise, a measurable and positive social impact will be achieved through the application of a method of producing goods that embodies its social objective - integration into employment of persons in the target groups.

The project is fully funded by the European Social Fund under Contract № BG05M9OP001-2.010-0231-C01 for the provision of grants under the Operational Program "Human Resources Development" 2014-2020 amounting to BGN 192 497.20 and an 19 month period of operation from 16.05.2018 to 31.12.2019

Keywords: vocational education, applied crafts, municipality, university lecturers, training centre.

UDC377

A UNIFYING LINK BETWEEN CARPENTRY, WEAVING AND SEWING TECHNIQUES IN APPLIED CRAFTS

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The preservation and restoration of age-old knowledge and skills for the fabrication of folk costumes and diverse household fabrics require parallel research on the items, techniques and equipment.

Clothing, as a finish of the processing on the fibrous raw, contains a wide variety of items and auxiliary materials: ladies' and men's folk costumes; fabrics, braids, threads, etc. The main materials are woven fabrics, which in our local conditions are known as shirts, broad cloth for low-cut sleeveless dress and homespun scarves for cloaks. These woven fabrics with minor modifications into the construction are spreading as fibrous items of the crafts in both the household and the manufactory. Moreover, handlooms are still in function for their workmanship.

The prospective intent of restoring and developing handicraft fabrics as inborn fabrics for folk costumes faces difficulty in using existing handlooms. These devices are very primitive and reflect the affordable 19th-century woodworking techniques, at the acceptable human expectations for good working conditions.

Hand weaving in our time is an essential part of the development and spread of creative techniques and productions. However, this weaving with the direct physical involvement of the weaver must satisfy the ease of application of the human body and limbs, as well as the possibilities of performing different weaves.

The task's solution directs the upcoming research to the development of a handloom with new functional requirements, while preserving the wood as the main constructive material. From this point of view, it is first necessary to distinguish and specify the work organs of the handloom according to their place in the construction, the interaction with the weaving threads and the access of the weaver.

Subject of the present work and one of the expected results of the metrological study is the relation between the physical and mechanical characteristics of the fibrous and wood materials. For example, the frame of the handloom implies solid and hardwood, while the harness requires light and hard wood with increased agility and overall mechanical resistance.

The present work was inspired around the project of Koprivshtitsa municipality, funded by the European Social Fund under Contract № BG05M9OP001-2.010-0231-C01.



Keywords: textile, handlooms, weaving, wood crafts, metrology, training units.

TWO PROJECTS OF THE MUSEUM OF THE TEXTILE INDUSTRY IN SLIVEN, DESIGNED FOR THE STUDY, PROMOTION AND CONTEMPORARY PRESENTATION OF TRADITIONAL TEXTILE PRACTICES

Toni DIMITROVA

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Abstract:

Two of the projects of the Museum of Textile Industry in Sliven, supported by the National Culture Fund, are related to the research, popularization, reconstruction and contemporary interpretation of some traditional textile practices as part of our intangible cultural heritage. One of them, successfully implemented in 2016-2017, is "Dyeing from Nature - Traditions and Science," the other currently active is called "Variations in Blue".

The activities of the Project "Dyeing from Nature - Traditions and Science" are aimed at exploring, describing, systematizing and generalizing knowledge's about the nature and traditions of textile dyeing in the past. The main purpose is to research the dyeing of plant natural dyes, to restore this practice and to offer some ideas for modern application. The project focuses mainly on the youth audience.

"Variations in Blue" focuses on two traditional practices - indigo dyeing and hand-made textile printing, exploring their individual beating and their joint appearance with a projection in the blue Kotel apron as part of the women`s costume.

Both projects have similar characteristics: attracting different age and attitude participants in project activities, unification the efforts of specialists from different fields of knowledge and the art for consulting and direct participation in the project, implementing different methods to realization the purposes, creating visible forms of intangible heritage, shaping a finished material product, popularizing the general public, offering some ideas for contemporary interpretation and forming a basis for enrichment and diversification museum activities.

Keywords: textile crafts, bio dyeing.



Scientific Association:

Technical University of Sofia
University of Chemical Technology and Metallurgy
of Sofia
Technical University of Gabrovo
Trakia University, Faculty of Technics and
Technologies of Yambol
South-West University of Blagoevgrad
New Bulgarian University of Sofia
Bulgarian Academy of Science, Laboratory of Bio
Active Polymers
Bulgarian Academy of Science, Laboratory of
Physical Technology of Sliven

Organising Association:

Federation of the Scientific Engineering Unions
Regional SEU of TGL of Plovdiv
Regional SEU of Gabrovo
Dobri Zhelyazkov Professional High School of
Textile and Clothing of Sliven
Dimitar Dobrovich National High School of Fine
Arts of Sliven
Museum of the Textile Industry in Sliven

The main organizer:

Scientific Engineering Union of
Textile, Garment and Leather, Bulgaria

Co-organiser:

Scientific and research sector
at TU - Sofia

Address of correspondence:

Rakovski 108, 1000, Sofia, Bulgaria
Phone: +359 2 980 30 45

Secretary: Mrs Tomina Galibova

E-mail: tok.secretary@fnts.bg

Fees:

- 60 BGN for university participants;
- 120 BGN for business participants.

The fee covers:

- Cocktail and Official Dinner;
- Coffee breaks;
- Participations in the conference sessions;
- Publication of the presented papers in «Textile and Garment magazine »
- **ISSN 1310-912X** (print),
- **ISSN 2603-302X** (Online), the journal of the Scientific Engineering Union of Textile, Garment and Leathers.

Bank account:

UniCredit Bulbank, Bulgaria
IBAN: BG43 UNCR 9660 1010 6722 00,
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**SCIENTIFIC ENGINEERING UNION OF
TEXTILE, GARMENT AND LEATHER,
BULGARIA**

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Within the "Days of Science"
At TU - Sofia,

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organize

XX NATIONAL TEXTILE CONFERENCE 2018 "Traditions and Innovations in Textile and Garment"

October 2-4th 2018

Inter Expo Center Ltd. - Sofia
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1784 Sofia, Bulgaria

Main Topics:

- Fibres and Yarns; Chemical Technologies; Nanotechnologies
- Textile Technologies: Spinning, Weaving, and Knitting
- Apparel Technology
- Textile art and Fashion Design
- Textile Machinery and Equipment
- Textile Management, Marketing and Sustainability
- Innovations in Textile Education

Instructions for authors

Templates are available online at:

www.tok-fnts.bg

➤ Abstract:

- ◆ In English
- ◆ The abstract should be prepared according to the abstract template and should be restricted to maximum 1 page
- ◆ The abstracts will be published in «Textile and Garment Magazine» issue 10/2018

➤ Presentation:

- ◆ Maximum 14 slides
- ◆ The presentation should be prepared with MS Office – Power Point
- ◆ The presentation should be no longer than 15 min.

➤ Poster:

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- ◆ Format A2

➤ Paper:

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- ◆ The paper should be prepared according to the paper template and should be restricted to maximum 12 pages

- ◆ The papers will be published in «

Textile and Garment magazine », ISSN

1310-912X (print), ISSN 2603-302X

(Online), issues from 11'2018 to 9'2019

DEADLINES

- Abstracts submission – September 3rd 2018
- Full papers submission – October 31st 2018
- Registration – October 2nd 2018

Languages: Bulgarian and English

XX National Textile Conference 2018

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The Topic of the Paper:

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Oral Presentation

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TEXTILE AND GARMENT MAGAZINE - GENERAL DESCRIPTION

According to data by SS. Cyril and Methodius National Library Sofia (<http://www.nationallibrary.bg>), the specialised Textile and Garment Magazine has been issued, without interruption, since 1949 and is the successor of Textile Review, which had been published in 1931 and 1932 in Sliven, with Editor-in-Chief P. Starbanov.

Inspired by the creators of the departments in Textiles at the Technical University of Sofia and the University of Chemical Technology and Metallurgy - Sofia, Prof. Agop Kevorkian and Prof. Kiril Dimov, the magazine has a scientifically applied character and publishes author's papers of lecturers from universities and research units as well as from vocational high schools in textiles, clothing and design.

The magazine also publishes materials from textiles and clothing industries.

The purpose of the magazine is to present to the highly specialized community in the country and abroad the achievements of the theoretical and experimental research of scientists and specialists from all points of view of textile science and practice.

The main topics of the published papers comprise chemical and mechanical technology of textile materials, technology and design of sewing products, textile art, textiles industry economics and the pedagogy of textiles training and education.

Editorial Board of the magazine does the selection and review of the papers collectively while over the years its Editors-in-Chief have been:

Assoc. Prof. Ivelin Rahnev - from 2015 until present;
Prof. Ivan Georgiev - from 2000 to 2015;
Prof. Georgi Nikolov Georgievich - from 1996 to 2000;
Prof. Ivan Hardalov - from 1995 to 1996;
Eng. Svilena Kissyova - from 1990 to 1995;
Prof. Petar Adarov - from 1984 to 1987
Prof. Atanas Chervendinev - from 1964 to 1984;
Editorial Board - from 1958 to 1963;
K. Pastarmadzhiev - from 1952 to 1957;
Stanka Tsekova - from 1950 to 1951;
Editorial Committee - since 1949.

Title of the magazine in Bulgarian: Текстил и облекло (Tekstil i Obleklo).

Title of the magazine in English: Textiles and Garments magazine.

The publisher of the magazine is:

The Scientific and Engineering Union of Textiles, Garments and Leather (SEUTGL)

UIC: 121111930, Bg121111930

Place of publishing: Sofia, Bulgaria

Status of the edition - currently published with:

ISSN 1310-912X (print) for the printed edition in hard copy;

ISSN 2603-302X (Online) for the printed online edition.

The Textiles and Garments magazine was first published online under its current title in 1996 with the 1st issue - Textiles and Garments, ISSN 1310-912X at www.tok-bg.org.

Since 2016, the issues under the same title: Textiles and Garments and with the same ISSN: 1310-912X have been available at www.tok.fnts.bg.

Since 2018, the issues under the same title: Textiles and Garments and with online ISSN 2603-302X are available at www.bgtextilepublisher.org.

Periodicity: 10 - 12 issues per year.

Format of the print and online edition: A4 with 10 quires (A3), including one quire for the colour cover and nine black and white quires for the paper's body of the magazine.

Language of the text: mainly in Bulgarian, abstracts - in English and some whole articles - in English the working language of foreign authors.

Origin of the published materials:

author's works by lecturers, researchers and specialists;

papers presented at conferences and other forums

Subject to Universal Decimal Classification - UDC (УДК):

33, Economics. Economic sciences.

377, Special Education. Vocational education. Vocational schools.

378, Higher Education / Higher Education Institutions.

677, Textile Industry. Technology of textile materials.

678, Industry of High Molecular Substances. Rubber industry. Plastic industry.

687, Tailoring (apparel) Industry.

745/749, Applied Art. Art Crafts. Interior. Design.

658.512.23, Artistic design (industrial design).

URL: www.tok.fnts.bg

www.bgtextilepublisher.org

Previous title and continuity of the magazine for the period of issue:

Since 1996: Textiles and Garments, ISSN 1310-912X (Print), ISSN 2603-302X (Online);

From 1990 to 1996: Textiles Industry, ISSN 1310-8069;

From 1985 to 1987: Light Industry and Services, ISSN 0205-1885;

From 1959 to 1996: Textiles Industry, ISSN 0495-0046;

From 1958 to 1958: Light industry: Textiles, ISSN 0455-6208;

From 1957 to 1957: Light industry: Textiles' edition, ISSN C625-9138;

From 1952 to 1957: Light industry, ISSN C617-924X;

From 1949 to 1950: Industry: a monthly edition of the Ministry of Industry, ISSN C616-9929.

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Sofia, March 2018

Ivelin Rahnev

INFORMATION FOR AUTHORS

SUBMISSION OF A MANUSCRIPT

- **Subject area.** The problems should concern problems of the textile science and practice following the Universal Decimal Classification - UDC:
 - 33, Economics. Economic sciences.
 - 377, Special Education. Vocational education. Vocational schools.
 - 378, Higher Education / Higher Education Institutions.
 - 677, Textile Industry. Technology of textile materials.
 - 678, Industry of High Molecular Substances. Rubber industry. Plastic industry.
 - 687, Tailoring (apparel) Industry.
 - 745/749, Applied Art. Art Crafts. Interior. Design.
 - 658.512.23, Artistic design (industrial design).
- **Submission of a manuscript** should be addressed to the Editorial Office via e-mail (textilejournal.editor@fnts.bg), the paper should be written in Bulgarian from Bulgarian authors and in English (working language) for foreigners.
- **Copyright Transfer Agreement** must be signed and returned to our Editorial Office by mail, fax or e-mail as soon as possible, after the preliminary acceptance of the manuscript. By signing this Agreement, the authors warrant that the entire work is original and unpublished, it is submitted only to this journal and all the text, data, Figures and Tables included in this work are original and unpublished and have not been previously published or submitted elsewhere in any form. Please note that the reviewing process begins as soon as we receive this document. In the case when the paper has already been presented at a conference, it can be published in our magazine only if it has not been published in generally available conference materials; in such case, it is necessary to give an appropriate statement placed in Editorial notes at the end of the article.

GENERAL STYLE AND LAYOUT

- **Volume of a manuscript** submitted should not exceed 12 standard journal pages in single column (3600 characters page), including tables, figures and photographs. Format of the submitted file is MS Office Word (normal layout). The editors reserve the right to shorten the article if necessary as well as to alter the title.
- **Title of a manuscript** should not exceed 120 characters.
- **Full names and surnames of the authors**, as well as full **names of the authors' affiliation** - faculty, department, university, institute, company, town and country should be clearly given. Corresponding author should be indicated, and their e-mail address provided.
- **Abstract of a manuscript** should be in English and no longer than one page.
- **Key-words** should be within 4-6 items.
- For papers submitted in English (any other working language), the authors are requested to submit a copy with a title, abstract and key words in Bulgarian.
- **SI units** should be used throughout.
- **Abbreviations** should be used according to IUPAC and ISO standards and defined when first used.
- **Figures** and illustrations with a title and legend should be numbered consecutively (with Arabic numerals) and must be referred in the text. Photographs should be numbered as Figures. Additionally, Figures should be integrated in the text with format **JPG at 300 dpi minimum**. Figures must be integrated in the text in **editable form**.
- **Tables** with a title and optional legend should be numbered consecutively and must be referred in the text.
- **Acknowledgements** may be included and should be placed after Conclusions and before References.
- **Footnotes** should be avoided. When their use is absolutely necessary, they should be numbered consecutively using Arabic numerals and appended at the end of the manuscript.
- **References (bibliography)** should be cited consecutively in order of appearance in the text, using numbers in square brackets, according to the **Vancouver system**.

REVIEWING PROCEDURE

The reviewing procedure for Textile and Garment Magazine is in accordance with the guidelines of the Ministry of Education and Science and can be presented as follows:

- Each paper submitted for publication is reviewed by at least two independent reviewers working in an institution different than the author's affiliation. The identity of the author/authors is concealed from the reviewers and vice-versa (**double-blind review**). In the case of controversial opinions of the reviewers, next reviewers are selected.
- A written review includes a clear conclusion of the article reviewed, concerning the conditions, which must be fulfilled in order to publish the article in Textile and Garment Magazine or a statement rejecting the article.
- First author receives a set of reviews and next, following the reviewing procedure, is obliged to correct the paper according to the reviewers' remarks or express his/her own opinion in writing.
- The corrected article and author's attitude are checked by the editors or by the same reviewers in case of any doubts. The Chairman of the Editorial Board takes by the Editor-in-Chief or, in extraordinary cases, the final decision regarding the publication of the article. If necessary, the authors are informed about the decision by e-mail.
- The identity of the reviewers of the particular articles is not given to public information.

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Юни 2018, София

От името на

Научно-технически съюз на текстила, облеклото и кожата:

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Председател

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XX НАЦИОНАЛНА ТЕКСТИЛНА КОНФЕРЕНЦИЯ 2018

"ТРАДИЦИИ И ИНОВАЦИИ
В ТЕКСТИЛА И ОБЛЕКЛОТО"

2-4 октомври 2018 г., София

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