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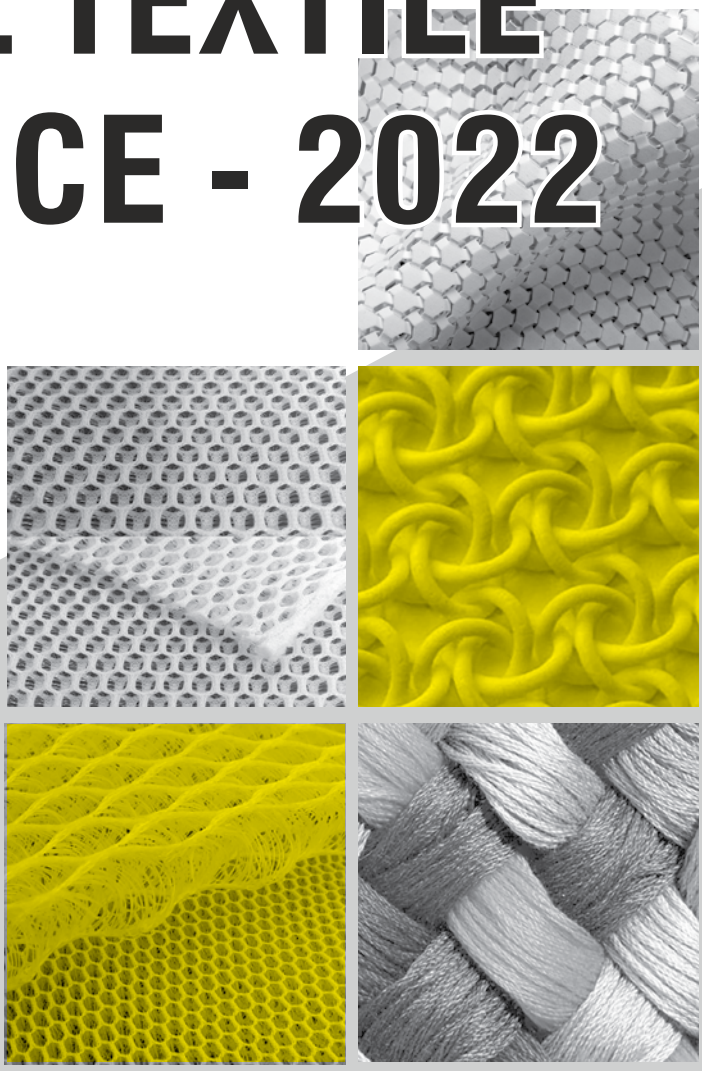

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НАУЧНО-ТЕХНИЧЕСКИ СЪЮЗ
ПО ТЕКСТИЛ, ОБЛЕКЛО И КОЖИ

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XXIV НАЦИОНАЛНА ТЕКСТИЛНА КОНФЕРЕНЦИЯ 2022 "ТРАДИЦИИ И ИНОВАЦИИ В ТЕКСТИЛА И ОБЛЕКЛОТО"

С ДОМАКИНСТВОТО НА ЮЗУ "Неофит Рилски" - Благоевград фонд "Научни изследвания" и в сътрудничество с катедрите по текстил и дизайн в Университетски център Бачиново - Благоевград

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- Papers submission - **November 30th 2022**
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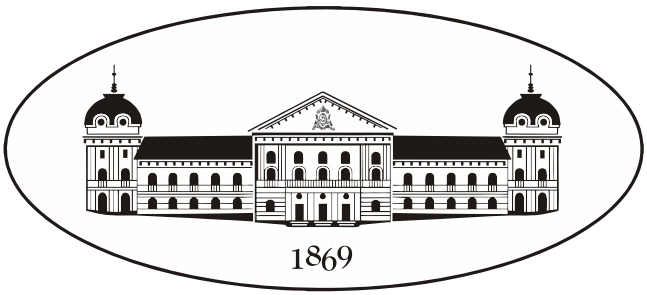
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ELECTROSPUN NONWOVEN TEXTILE FROM POLYLACTIDE AND DERIVATIVE OF JEFFAMINE ED® AND 8-HYDROXY-QUINOLINE-2-CARBOXALDEHYDE AND ITS COMPLEX WITH Cu^{2+}: PREPARATION AND ANTITUMOR ACTIVITY

Nikoleta Stoyanova[1], Milena Ignatova[1], Nevena Manolova[1], Iliya Rashkov[1], Reneta Toshkova[2], Ani Georgieva[2]

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Introduction: 8-Hydroxyquinoline and its derivatives are very attractive for biomedical applications due to their beneficial biological properties - antimicrobial, antitumor, antioxidant and anti-inflammatory [1]. These compounds also had the ability to form complexes with biologically important transition metal ions (Cu^{2+}, Fe^{2+}, Fe^{3+}, etc.), which accounts for their biological activity. The incorporation of these biologically active compounds in electrospun nonwoven textile can impart favorable biological properties to the textile. In the present study, electrospun nonwoven textile of polylactide (PLA) containing a Schiff base from Jeffamine ED® and 8-hydroxyquinoline-2-carboxaldehyde (Jeff-8Q) or its complex with Cu^{2+} (Jeff-8Q.Cu^{2+}) of various designs were prepared. The influence of the composition of the obtained textiles on their antitumor properties was estimated.

Experimental part: Schiff base derivative of Jeffamine ED® and 8-hydroxyquinoline-2-carboxaldehyde (Jeff-8Q) and its complex with Cu^{2+} (Jeff-8Q.Cu^{2+}) were obtained by the procedure described earlier [2,3]. The morphology of the fibrous materials was evaluated by scanning electron microscopy (SEM, Jeol JSM-5510 (Tokyo, Japan)). The antitumor activity of the mats was estimated using the MTT assay. Custom-made electrospinning equipment was used.

Results and Discussion: For the first time Jeff-8Q- or Jeff-8Q.Cu^{2+}-containing fibrous materials of various designs were obtained by applying one-pot electrospinning (type "*in*") or electrospinning combined with dip-coating (type "*on*"). Electron paramagnetic resonance (EPR) analysis was performed to examine the complexation of Cu^{2+} in the Jeff-8Q.Cu^{2+}/*in*PLA and Jeff-8Q.Cu^{2+}/*on*PLA mats. The *in vitro* release of Jeff-8Q or its complex with Cu^{2+} from the type "*on*" electrospun nonwoven textile was more rapid than that of the type "*in*" textile. The performed MTT cell viability studies revealed that in contrast to the neat mats, the Jeff-8Q- or Jeff-8Q.Cu^{2+}-containing fibrous materials (both types "*in*" and "*on*") displayed good cytotoxicity against human cervical HeLa tumor cells. Fluorescence microscopy analyses indicated that the induction of apoptosis is one of the major mechanisms of the antitumor efficacy of the obtained electrospun nonwoven textile.

Conclusion: The results suggest that the prepared novel electrospun nonwoven textile containing Jeff-8Q or Jeff-8Q.Cu^{2+} are promising candidates for local application in the treatment of cervical tumors.

Keywords: Schiff base, 8-hydroxyquinoline derivative, electrospinning, antitumor activity

Acknowledgments: Financial support from Bulgarian National Science Fund (Grant KP-06-N39/13/2019) is gratefully acknowledged.

[1] Gupta R., Luxami V., Paul K., *Bioorganic Chemistry* 108, 104633 (2021)

[2] Mladenova R., Ignatova M., Manolova N., Petrova T., Rashkov I., *European Polymer Journal* 38, 989-999 (2002)

[3] Ignatova M., Stoyanova N., Manolova N., Rashkov I., Kukeva R., Stoyanova R., Toshkova R., Georgieva A., *Materials Science and Engineering C* 116, 111185 (2020)

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ELECTROSPUN POLY (METHYL METHACRYLATE) - BASED COMPOSITES FOR PHOTOCATALYTIC WATER TREATMENT

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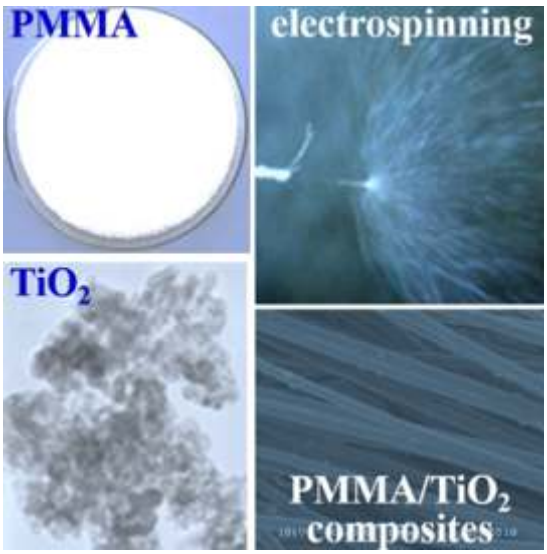
Introduction Electrospun materials are considered to be the most versatile candidates for the effective treatment of water, filtration, and separation because of their high surface area, high porosity, and light weight. In order to improve their applicability and performance for use in water treatment, metal oxide nanoparticles have been incorporated into materials. Thus, the key challenge in water treatment is to prepare appropriate electrospun composites with a high efficiency and low environmental impact.

Experimental part Poly (methyl methacrylate) (PMMA, average molecular weight ~ 350,000 g/mol) and titanium (IV) oxide (TiO_2 nanopowder, 99.7% anatase) were purchased from Sigma Aldrich. N,N-dimethylformamide and methylene blue B (MB) were purchased from Merck. All reagents were of an analytical grade of purity and were used as received without further purification.

Results Electrospinning was successfully used for the one-step fabrication of poly(methyl methacrylate) fibers loaded with an inorganic photocatalyst - TiO_2. Besides the electrospinning conditions, the TiO_2 content in the PMMA solution was varied in order to fabricate PMMA fibers filled with significant amounts of TiO_2. The morphology of the electrospun composites was affected by the amount of TiO_2 incorporated into the PMMA fibers. In addition, the inorganic photocatalyst had an impact on the wettability, thermal stability, and optical properties of the electrospun composites. In particular, the surface wettability of the composites was strongly influenced by UV light irradiation and from hydrophobic became superhydrophilic. Moreover, PMMA/TiO_2 composites had enhanced tensile strength. The optical properties, photocatalytic activity when using methylene blue as a model organic pollutant, and reusability of the composites were evaluated with respect to targeted application.



Conclusion PMMA/TiO_2 composites were successfully fabricated in one step by electrospinning. They preserve their photocatalytic activity almost completely after three uses in the presence of a model organic pollutant - MB. Thus, the proposed original and simple approach is very promising for the future development of highly efficient composites for photocatalytic water treatment.

Keywords: electrospinning; poly(methyl methacrylate); TiO_2; UV-induced wettability; mechanical properties; photocatalysis.

Acknowledgments: This research was partially funded by the European Regional Development Fund within the OP "Science and Education for Smart Growth 2014 - 2020", grant number BG05M2OP001-1.001-0008-C01. Research equipment of Distributed Research Infrastructure INFRAMAT, part of Bulgarian National Roadmap for Research Infrastructures, supported by Bulgarian Ministry of Education and Science was used in this investigation.

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ONE-STEP FABRICATION OF POLYMER HYBRIDS CONTAINING MN-DOPED ZNSE/ZNS NANOCRYSTALS

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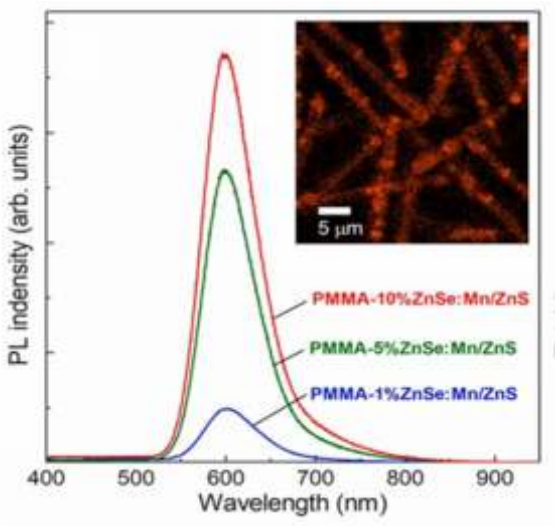
Introduction Semiconductor nanocrystals (NCs) doped with transition metal have intensively studied because of their unique optical properties and enormous applications. Among them, ZnS or ZnSe NCs doped with Mn-ions attracted much attention, because Mn-ions are easily incorporated into the II-VI host crystalline lattice. However, developing a method for simple and effective incorporation of highly luminescent NCs into appropriate polymer matrices for fabrication of solid-state lighting and flat-panel displays, still remains a great challenge.

Experimental part Commercially available zinc acetate (99.9%), manganese acetate (99.9%), 3-mercaptopropionic acid (99%), selenium powder (99.5%), sodium sulfide, as well as polyacrylonitrile (PAN, 150000 g/mol) and poly(methyl methacrylate) (PMMA, 350000 g/mol) were supplied from Sigma-Aldrich. All chemicals were of analytic grade of purity and used as received without further purification.

Results In the present study, in order to fabricate fibrous polymer hybrids with predetermined high photoluminescence (PL) efficiency, Mn-doped ZnSe/ZnS (Mn : ZnSe/ZnS) core/shell NCs were synthesized and embedded into PMMA and PAN fibers, respectively. By varying the conditions for electrospinning, the optimal conditions for the formation of a Taylor cone were found for both PMMA and PAN spinning solutions. Thus, by one-step electrospinning of PMMA/NCs and PAN/NCs mixtures, fibrous polymer hybrids were prepared. Detailed morphology of the hybrids was observed by SEM, while the distribution and crystallinity of the embedded NCs were determined by TEM/SAED. Optical properties were also studied in details by photoluminescence spectroscopy. Finally, PL efficiency was evaluated to show the potential of prepared polymer hybrids prospective for emitters-production as solid-state illumination sources and lighting devices.



Conclusion An appropriate conditions for successful embedding of Mn:ZnSe/ZnS core/shell NCs in PMMA and PAN fibers were found and by one-step electrospinning novel Mn:ZnSe/ZnS-in-PMMA and Mn:ZnSe/ZnS-in-PAN hybrids with enhanced luminescence were fabricated.

Keywords: Mn-doped ZnSe/ZnS core/shell nanocrystals, electrospinning, PAN hybrids, PMMA hybrids, photoluminescence.

Acknowledgments: This research was partially funded by the European Regional Development Fund within the OP "Science and Education for Smart Growth 2014–2020", grant number BG05M2OP001-1.001-0008-C01. Research equipment of Distributed Research Infrastructure INFRAMAT, part of Bulgarian National Roadmap for Research Infrastructures, supported by Bulgarian Ministry of Education and Science was used in this investigation.

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INNOVATIVE ANTIOXYDANT BIOPOLYMER/PLANT EXTRACT MATERIALS PREPARED BY ELECTROSPINNING

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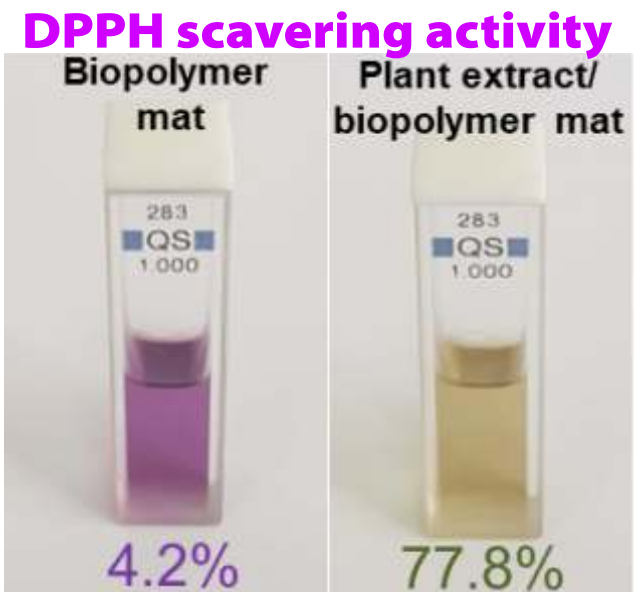
Introduction Electrospinning has gained considerable attention due to its versatility for producing fibrous materials with outstanding characteristics, such as high porosity, small diameter, excellent pore interconnectivity, high surface-to-volume ratio, ease of functionalization for various purposes and superior mechanical properties. These useful characteristics make the nanofibrous materials perspective candidates for many applications such as scaffolds for tissue engineering and cell culture, wound dressings drug delivery cosmetics, protective clothing, filtration and thermal insulation, electronic and semi-conductive materials. Natural products can be obtained from four main sources: plants, animals, marine organisms and microorganisms. They exhibit tremendous chemical and structural diversity. Since ancient times, plant species had medicinal use with better patient tolerance and acceptance. Encapsulation of plant extracts, through electrospinning, can accelerate their remedial potential. This process increases the therapeutic potential by improving bioavailability and maintains a steady concentration of bioactive compound to the target area. The aim of the present study was to prepare and to characterize novel fibrous materials based on a biocompatible polymer containing a crude extract by electrospinning.

Results and Discussion The optimal process conditions for the preparation of defect-free fibers were found. The newly obtained fibrous materials were fully characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), differential scanning calorimetry (DSC), X-ray diffraction analysis (XRD) and water contact angle measurements. It was found that the incorporation of the crude extract had significant effect on the average fiber diameter, thermal characteristics and structure of the obtained materials. Moreover, it was found that the electrospun PLA/P. oleracea materials showed high antioxidant activity.



Conclusion Extract-containing fibrous mats exhibited high antioxidant activity as estimated by DPPH free radical scavenging method. Therefore, the created innovative mats might have a practical use for wound healing applications, as well as in food industry.

Keywords: plant extract; biopolymer; electrospinning; high antioxidant activity

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NOVEL POLYLACTIDE/PORTULACA OLERACEA FIBROUS MATERIALS FOR BIOMEDICAL APPLICATIONS

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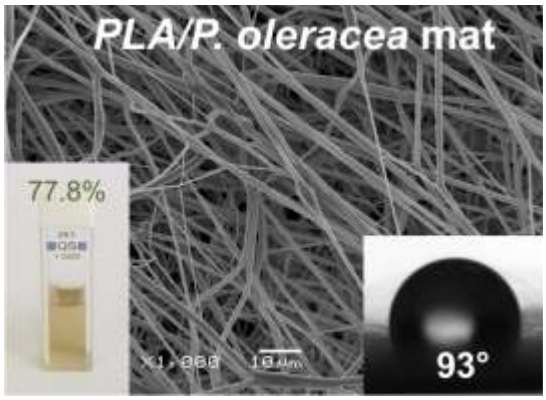
Introduction: Health concerns associated with the side effects of synthetic compounds used in medicine, pharmacy, cosmetics, and food industry as well as the emergence of antibiotic resistance of pathogens has driven electrospinning research towards the development of fibers encapsulating plant extracts. Portulaca oleracea possesses a wide spectrum of pharmacological properties such as neuroprotective, antimicrobial, antidiabetic, antioxidant, anti-inflammatory, antiulcerogenic, and anticancer activities and therefore is used to relieve symptoms and treat a wide range of diseases, including gastrointestinal diseases, respiratory disorders, liver inflammation, kidney and bladder ulcers, fever, insomnia, inflammation and headaches. In the recent years great research interest has been directed toward encapsulation of bioactive plant extracts into electrospun fibrous materials. However, up to now there are no data in the literature focused on fabrication of fibrous electrospun materials loaded with P. oleracea extract.

Results and Discussion: The electrospinning of PLA solution (polymer concentration 10 wt%) under the selected conditions reproducibly resulted in obtaining uniform fibers with mean fiber diameter of 1100 ± 200 nm. The addition of P. oleracea (1; 5 or 7.5 wt%) to the PLA spinning solution led to the preparation of fibers with larger diameters. XRD analyses revealed that the initial P. oleracea extract is in crystalline state. In the XRD pattern of PLA/P. oleracea fibrous materials characteristic diffraction peaks with high intensity corresponding to P. oleracea were not observed. DSC thermograms showed that the incorporation of the extract in the PLA fibers resulted in shifting of Tg and Tcc of PLA to lower temperatures accompanied with decrease in the degree of crystallization of the polyester. Moreover, P.oleracea incorporated into PLA fibers exhibits antioxidant activity. The efficiency of the obtained fibrous materials to enhance the proliferation of mouse BALB/c 3T3 fibroblasts was evaluated. The obtain results show that the fibrous materials loaded with P. oleracea were biocompatible and no toxic to normal cells.



Conclusion: Thus obtained novel materials could be a potential candidate for tissue regeneration and wound healing applications.

Keywords: Portulaca oleracea; PLA; electrospinning; antioxidant activity, cell culture

Acknowledgments: This work was supported by Operational Program ‘‘Science and Education for Smart Growth’’ 2014-2020, co-financed by European Union through the European Structural and Investment Funds, Grant BG05M2OP001-1.002-0012 ‘‘Sustainable utilization of bio-resources and waste of medicinal and aromatic plants for innovative bioactive products”. Research equipment of Distributed Research Infrastructure INFRAMAT, part of Bulgarian National Roadmap for Research Infrastructures, supported by Bulgarian Ministry of Education and Science was used in this investigation.

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COTTON FABRIC WASTE CONVERSION TO VALUBLE CHEMICALS

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Today, the circular economy is a powerful engine for new technology development. Besides the environmental benefits, the economic ones are also important. The strong incentive for recycling processes is the waste conversion into valuable products. Cotton is comfortable to wear and use, so the amount of scrap is significant. The sources of cotton waste are pre-consumer and post-consumer cotton. Recycling processes have considerable benefits when the waste fabric cotton is converted again into fibres or valuable chemicals. Biomass containing cellulose, including textile waste, is a promising raw material for a new generation of liquid fuels and chemicals such as 5-hydroxymethyl furfural (HMF).

After processing, cellulose is a source of glucose. There are many studies on the production of ethanol from waste textiles. Cellulose can be transformed into other valuable chemicals as HMF through a series of chemical reactions: hydrolysis of cellulose to glucose, isomerization of glucose to fructose, and dehydration of fructose to HMF. With the help of homogeneous and heterogeneous catalytic processes, HMF is converted into 2,5-dimethylfuran (DMF), 2-methylfuran (2-MF) and long-chain hydrocarbon alkanes. The latter have properties that make them potential substitutes for petroleum fuels. By HMF oxidative conversion can be obtained 2,5-furandicarboxylic acid (FDCA). This bio-based monomer is used for polyester, polyamides, etc. polymers production, finding application in different areas, such as textiles, packaging, and coatings, among many others.

The difficulties in these processes stem from the fact that textile waste cannot be converted in one step, the yield of glucose and HMF is low, and side products are produced that inhibit reactions, rehydration of HMF and polymerization between sugars and HMF. The other barrier to recycling cotton is the cellulose fibres' great strength and crystalline structure due to possible hydrogen bond formation. The fabrics are often a mix of materials, which makes separating cotton difficult. Each textile is further processed to improve its properties - colour, fire resistance and wrinkle, etc. These treatments make the waste conversion to glucose difficult, and pretreatment is necessary.

Various methods for this facilitate the hydrolysis of cellulose to glucose. These are mechanical, chemical (acidic or alkaline), hydrothermal, ultrasonic, microwave, enzymatic, etc. and their combination. An effective pretreatment method is the steam explosion, which uses steam, high temperature, and pressure. The sudden pressure reduction results in the mechanical processing of the hydrolyzed product. This method is also used in combination with other methods.

The present work aims to obtain glucose from cotton-based textile waste as a raw material for FURan-based chemical synthesis. The tasks to be performed in this plan are to select appropriate methods for the cotton waste pretreatment to obtain the highest possible glucose yields.

Keywords: cotton waste pretreatment, 5-hydroxymethyl furfural, 2,5-furandicarboxylic acid, glucose conversion

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ANTIMICROBIAL PROPERTIES OF FLUORESCENT COTTON FABRIC, MODIFIED WITH CHITOSAN OR LAYER-BY-LAYER COATED WITH CHITOSAN AND ALGINATE

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Introduction: The cotton fabric modification with fluorescent hydrogel or coating organized layer-by-layer is the way to obtain intelligent interfaces with controllable properties. These composite materials can find different biomedical, ecological, etc. applications. Natural polysaccharides such as chitosan and alginate are eco-friendly, biodegradable polymers. They can form films on the cotton surface via electrostatic interaction between their opposite charges. The modification of chitosan with 1,8-naphthalimide fluorophore enables the following swelling and erosion of the obtained hydrogel on the fabric surface via changes in its fluorescent emission.

This study aims to prepare and compare the antimicrobial properties of cotton fabric composites modified with cross-linked fluorescent chitosan with citric acid and the same material coated with alginate as a second layer.

Experimental part: Cotton fabric was impregnated with citric acid and with solution of chitosan and chitosan modified with 1,8-naphthalimide fluorophore. The second material was obtained as the previous one but as a last step the fabric was immersed in an alginate solution. The obtained materials have been characterized by optical and scanning electron microscopy and fluorescent, gravimetric and thermal analysis (TG-DTA-DTG). Their antimicrobial activity was investigated against Gram-positive Bacillus cereus and Gram-negative Pseudomonas aeruginosa used as model strains.

Results and Discussion: The surface morphology of composites, investigated by optical and scanning electron microscopy, shows that the chitosan layer wrapped the cotton fibres. The alginate treatment of the sample resulted in a denser layer with an uneven grain structure that bonded the fibres. On the fabric surfaces, irregularly scattered colour spots were observed due to the 1,8-naphthalimide-modified chitosan. The alginate layer application on the surface improved the thermal stabilities of cotton fabric with the residual chars increased. Swelling and erosion of hydrogel in phosphate buffer pH 7.4 at 37 °C caused a decrease in fluorescence emission, which was more pronounced in the sample with the alginate layer. The antimicrobial activity of the cotton samples has been evaluated against B. cereus and P. aeruginosa as model bacterial strains. The analysis showed that the sample containing only chitosan almost entirely inhibited the growth of both bacterial strains. The fabric covered with alginate inhibited the growth of P. aeruginosa and B. cereus by 63% and 92%, respectively.

Conclusion: Surface treatment of cotton fabric with cross-linked fluorescent chitosan and then with alginate as a second layer can modify its thermal and antibacterial properties due to a change in the layer structure and the positive charge of chitosan.

Keywords: chitosan, alginate, cotton fabric, 1,8-naphthalimide

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ALTERNATIVE FUEL DESULPHURISATION METHODS

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The continuous growth of fossil fuels consumption led to a problem associated at first with the corrosive action of certain types of sulfur compounds and later with the negative impact of hetero atomic compounds in fossil fuels on the environment. In this regard, investigations related to the purification of petroleum products from sulphur compounds is important. In petroleum they are in the form of mercaptans, sulphides, disulfides, thiophenes and benzothiophenes. To remove sulphur compounds from fuels over the past few decades, refineries mainly use hydrodesulphurization (HDS). The process is carried out in conditions of high pressure and temperature, in the presence of a catalyst. In the literature, a large number of alternative methods of hydrodesulphurization are described, such as: oxidative desulphurization and its varieties; alkylation; extraction desulphurisation; conversion/extraction desulphurisation in different variants; desulphurisation by precipitation, biodesulfurization, etc.

Particular attention among the listed methods occupies the method of adsorption desulphurization. This is technologically not complicated, energy-efficient and at the same time one of the most effective methods for removing diverse pollutants from different environments. The method is based on the ability of the solid adsorbent to selectively adsorb organic sulphur compounds from fuels.

Various porous materials such as activated aluminium oxide, zeolites, carbon materials and others have been studied as adsorbents to remove organic sulphur compounds from model and real fuels. In recent years, biosorbents have increasingly been paid attention, as they are effective and with low cost. One of the promising raw materials for biosorbent synthesis are rice husks - waste, the annual accumulation of which creates serious environmental problems. Our research shows that an adsorbent obtained by pyrolyzed rice husks has good potential for adsorption desulphurization of liquid fuels. Its adsorption affinity decreases in the order: thiophen>benzothiophen>dibenzothiophene.

Of interest is an innovative study using composite material synthesized from textiles and metal organic frameworks (MOF) for adsorption purification of thiophen from model fuels [1]. An *in-situ* method for modifying cotton and wool with MOF by infrared technology was used. The reported results confirm expectations that the sorption capacity of the obtained textile materials increases after their modification. A decrease in the sorption capacity of composites has been observed after their regeneration, which is explained by a decrease in the amount of MOF on their surface. This study will open the way for using infrared radiation for preparing textile based MOF composite materials which are oriented in desulphurization application.

Keywords: bioadsorbents, desulphurization, fuels, textile composites.

[1] Emam, H.E., Ahmed, H.B., El-Deib, H.R., El-Dars, F.M.S.E., Abdelhameed, R.M., Non-invasive route for desulfurization of fuel using infrared-assisted MIL-53(Al)-NH2 containing fabric (2019) Journal of Colloid and Interface Science, 556, pp. 193-205.

The authors acknowledge the support through Project No 12231 Purification of model fuels from sulphurorganic compounds using bioadsorbent. Adsorption isotherms.

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INFLUENCE OF COTTON FABRIC MODIFICATION ON ITS ABILITY FOR OIL-WATER SEPARATION

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Introduction: Spills of oil and oil products occur very often around the world, despite the measures taken to prevent them. Similar water pollution may also occur in the Black Sea and the Danube, and the reasons for this are port and ship operations. Hence, the development of methods and means to eliminate these contaminants from water continues to be relevant. Sorbent materials are one of the most effective, easy for application and inexpensive ways to clean up spills. The sorption rate and capacity of the material, its buoyancy, flexibility, hydrophobicity and water stability are some requirements for their successful application. The other environmental demands are the possibility of regeneration by concentrating the adsorbed oil, the reuse of the materials and their subsequent safe destruction. An ideal sorbent should be highly oleophilic and hydrophobic at the same time. Cotton fabric has many excellent properties suitable for this application. However, cotton is hydrophilic and has to be modified to perform oil sorption activity.

This study aims to prepare composite materials from cotton fabric modified with aldehyde functionalized chitosan and with added ZnO and to compare their properties to remove oil from water.

Experimental part: The first material contains a cotton fabric impregnated with chitosan solution and glutaraldehyde. In the second material preparation, Zn ions were added to chitosan and converted to ZnO particles. The third material was obtained with chitosan, modified with benzaldehyde, and crosslinked on cotton fabric. The fourth material was acquired as the third one and contained ZnO particles.

Results and Discussion: The materials were investigated as sorbents for crude oil in water. The largest sorption capacity for oil was obtained with the fourth sample, followed by the third sample. Slightly lower results were obtained for the second sample, containing unmodified chitosan. The possibility for the adsorption-desorption of oil and the reuse of the sorbents have also been investigated. All materials were regenerated successfully with hexane and reused for complete oil removal. In vitro antimicrobial activity was studied by finding the growth inhibition of model microbial strains (Gram-positive bacteria Bacillus cereus, Gram-negative bacteria Pseudomonas aeruginosa and the fungus Candida lipolytica). The results have shown that cotton fabric obtained with benzaldehyde-modified chitosan has better antimicrobial properties than that obtained with chitosan alone. The presence of zinc oxide particles in the samples completely inhibited the growth of all three model strains.

Conclusion: The material's hydrophobicity was enhanced with the benzaldehyde chitosan modification, improving the oil sorption capacity. This material is easy to use, regenerate, and reuse and has good antimicrobial properties. The presence of ZnO refines the material performance.

Keywords: chitosan, benzaldehyde, oil–water separation, antimicrobial

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ANTIMICROBIAL PHOTODYNAMIC ACTIVITY OF COTTON FABRICS MODIFIED WITH FLUORESCENT DENDRIMERS

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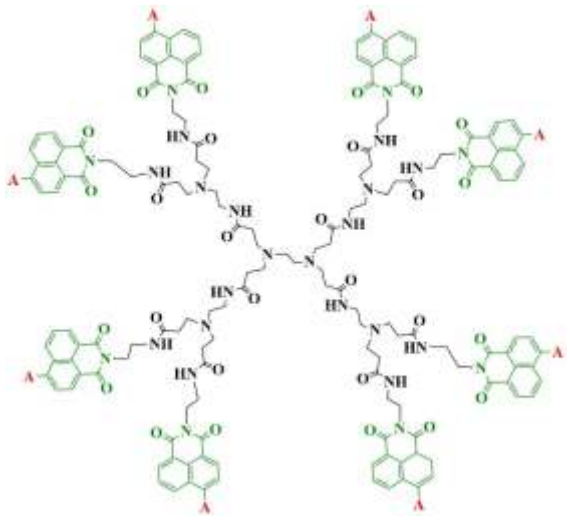
The adaptability of the pathogenic microorganisms caused by their rapid multiplication rate is responsible for their increased resistance to antimicrobials used in clinical practice. In relation to solving this problem, the search for new more effective compounds with improved antimicrobial properties is required. Scientists are now focusing their efforts on the design, synthesis and investigation of low and high molecular weight compounds (linear, branched, dendrimers) of different nature and structure, with the aim of discovering and developing new substances with antimicrobial activity.

The antimicrobial activity of dendrimers and hyperbranched polymers is due to their ability to bind to the bacterial cell surface, disrupting the permeability and integrity of the membrane. They can adsorb and form nanosized films on textile surfaces under various interactions.



The antimicrobial activity of cotton fabrics is influenced by several factors, such as mechanical retention of microbial cells on the fabric depending on the surface morphology; dispersion of the antimicrobial material on the textile surface; and change in the hydrophobic/hydrophilic nature of the materials, which can affect the degree of contact of the microbial inoculum with the fabric. The antimicrobial effect of treated textile fabrics is due to the slow release of biologically active substances into the medium or direct contact with microbial cells. Microbial adhesion as a first stage in biofilm formation can be limited by the interaction of dendrimers with the cell surface or with ions that stimulate microbial adhesion, resulting in a change in cell wall properties and preventing microbial attachment.In this case, the dendrimers inhibit the secretion of extracellular biopolymers, leading to the detachment of cells from the surface of the cotton tissue and thus to the prevention of biofilm formation. This shows good prospects for the use of such compounds for the production of antibacterial textiles.

As photoactive compounds, these dendrimers, whose activity is retained even after deposition on textile materials, indicate that they are suitable candidates for application in antibacterial photodynamic therapy. This is a new area against the bacterial resistance to antibiotics used in the medical practice and future research should be directed in this area.

Keywords: cotton fabric, dendrimer. antimicrobial, photodynamic therapy, fluorescence

Acknowledgements

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POSSIBILITIES FOR MODIFYING COTTON FABRICS WITH TITANIUM NANOPARTICLES. ADVANTAGES AND CHALLENGES OF THE PROCESS

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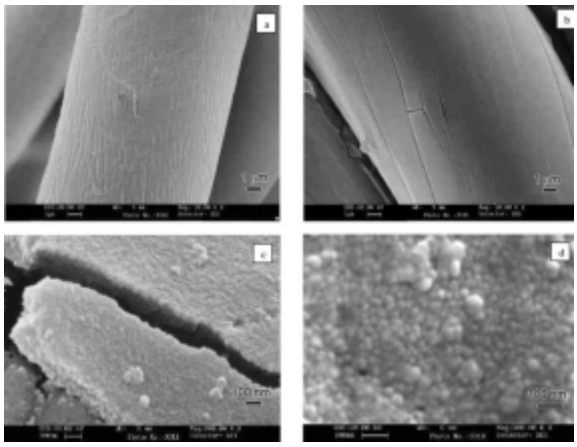
Introduction

Extraordinary photocatalytic activity, non-toxicity, high availability, biocompatibility, and low price make TiO_2 nanoparticles particularly attractive for manufacturing of different high value-added products. During the past several years, many efforts have been made to immobilize TiO_2 nanoparticles onto textile materials with an aim to produce goods with multifunctional properties such as UV protective, selfcleaning and antibacterial. The processing of textile materials with TiO_2 nanoparticles is relatively simple, but insufficient binding efficiency between certain fibers and TiO_2 nanoparticles imposes a problem concerning the stability and durability of nanocomposite systems during their exploitation. Therefore, recent studies were more oriented toward chemical and physico-chemical modification of fiber surfaces that may enhance the binding efficiency of TiO_2 nanoparticles. This article looks at some latest advances in finishing of different textile materials with TiO_2 nanoparticles.

The mechanism of TiO_2 action

The size, shape, crystalline structure and specific surface area determine the chemical, optical, and electrical properties as well as photocatalytic activity of TiO_2 NPs. The exposure of TiO_2 NPs to UV light with an energy that matches or exceeds its band gap energy leads to an excitation of electron from valence band into conduction band while the positive hole is left behind.



The application of TiO_2NPs to textile materials

The impregnation of textile materials with TiO_2 NPs is typically conducted by dip-coating method. After being immersed in TiO_2 NPs colloid or suspension for certain time, the fabrics are padded, dried and cured. Afterwards, they are usually rinsed with water and dried. This procedure is described here in rough outline. Although the times of immersion in the colloid, padding pressures, temperatures and times of drying and curing as well as rinsing methodologies vary from author to author, the methods of coating are principally the same.

Conclusion

This review clearly indicates that huge potential of TiO_2 nanoparticles could be efficiently utilized for imparting antibacterial, self-cleaning and UV-protective properties to various textile materials. Simple routs for processing of textile materials with TiO_2 nanoparticles and the fact that small amount of this cheap, chemically and physically stable photocatalyst provide desired effects make TiO_2 nanoparticles particularly attractive finishing agent which can find a broad application in textile industry.

Keywords: TiO_2 nanoparticles, textile materials, UV protection, photocatalytic activity, antibacterial activity

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STUDY ON THE APPLICATION OF DBD PLASMA IN FLAME RETARDANT TREATMENT FOR DYED COTTON FABRICS

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Introduction: Cotton is one of the most used textile fibres. However, it is a combustible material with a low LOI of 18.4% [1]. Therefore, flame retardant treatment for cotton fabrics, especially durable flame retardant, is an important requirement for many areas of use. Many studies have shown that Pyrovatex CP New (PCN) combining crosslinking agents such as trimethylolmelamine (TMM) or 1,3-dimethylol-4,5-dihydroxyethylene urea (DMDHEU) is a very good choice to create durable flame-retardant cotton fabrics. However, they release formaldehyde, and their mechanical strength is reduced compared with pre-treatments because the crosslinking reaction occurs at high temperature and requires the use of phosphoric acid as a catalyst [2-4]. In our recent studies, a new formaldehyde-free crosslinking agent (Knittex FFRC (K-FFRC)) was used as a replacement for the old one as a solution to reduce the release of free formaldehyde from fabrics [5, 6]. However, our research has shown that when treating cotton fabric with PCN and K-FFRC, for the treated fabric to be fire resistant (LOI > 25), the curing temperature must be greater than 170°C and the time curing must also be longer than 120 seconds. It is this condition that reduces the mechanical strength of cotton fabric [7]. To solve this problem, we pre-treated cotton fabric with DBD plasma for 90 s, plasma treated fabric then treated with PCN and K-FFRC. The results show that the fabric has been pre-treated with plasma, during the flame-retardant treatment it only needs to be cured at 160°C for 90 seconds to have a LOI > 25. To achieve this value, the normal cotton fabric must be cured at 180°C for 120s during flame retardant treatment [7, 8]. This study also shows that too strong plasma treatment conditions (high plasma power, prolonged exposure time) also adversely affect the mechanical performance of cotton fabrics. These studies are all performed on white cotton fabrics after pre-treatment, while functional finishing is usually carried out on dyed fabrics. In dyed cotton, some of the active radicals are usually occupied by dye molecules, so their level of reactivity is different from that of undyed fabrics. Therefore, in this study, DBD plasma was applied on dyed cotton fabrics before they were flame retardant treated with PCN and K-FFRC. The objective of this study was to clarify the effect of DBD plasma treatment on flame retardant treatment for the dyed cotton fabric.

Experimental: *Procedure:* Dyed woven cotton fabric with mass of 242/m^2 was supplied by NASILKMEX -> APDBD plasma treatment with plasma power of 400 W (1 W/cm^2) for 30s -> Flame retardant treatment with PCN and K-FFRC -> Flame retardant dyed cotton fabric -> Washing fabric according to ISO 6330 for 5 cycles.

Testing: Flammability of fabric by ASTM D 6413 -2015 and determination of LOI of fabric by ASTM D 2863 - 97 befor and after flame-retardant treatment and after washing. Measurment of color of fabric befor and after DBD plasma treatment.

Result: The results showed that the DBD plasma pre-treatment improved the efficiency of the flame retardant process for the dyed cotton fabric: the LOI of the fabric before and after washing were both improved compared to samples not pre-treated with DBD plasma. However, compared with the white fabric, the flame-retardant treatment condition for dyed cotton fabric needs to be stronger for the flame retardant treated fabric to have the desired flame retardant properties. The results also showed that plasma treatment also changed the color of dyed cotton fabrics. The color of the fabric tends to be lighter after plasma treatment.

***Keywords*:** Dyed cotton fabric, DBD plasma, Flame retardant, Pyrovatex CP new, Knittex FFRC

References:

1. Kilinc, F.S., *Handbook of fire resistant textiles.* 2013.
2. Katović, D., et al., *Formaldehyde free binding system for flame retardant finishing of cotton fabrics.* 2012(1 (90)): p. 94-98.
3. Yasin, S., et al., *In situ degradation of organophosphorus flame retardant on cellulosic fabric using advanced oxidation process: A study on degradation and characterization.* 2016. 126: p. 1-8.
4. Poon, C.-k. and C.-w.J.C.p. Kan, *Effects of TiO2 and curing temperatures on flame retardant finishing of cotton.* 2015. 121: p. 457-467.
5. Khanh, V.T.H. and N.T.J.I.T. Huong, *Influence of crosslinking agent on the effectiveness of flame retardant treatment for cotton fabric.* 2019. 70(5): p. 413-420.
6. Huong, N.T., V.T.H. Khanh, and N.P.D.J.I.T. Linh, *Optimizing content of Pyrovatex CP New and Knittex FFRC in flame retardant treatment for cotton fabric.* 2021. 72(3): p. 315-323.
7. Nguyen, H.T. and H.K.-T.T.P. Vu, *OPTIMIZING CURING CONDITIONS IN FLAME RETARDANT TREATMENT FOR COTTON FABRIC.* 2019.
8. Nguyen Thi, H., et al., *Application of Plasma Activation in Flame-Retardant Treatment for Cotton Fabric.* 2020. 12(7): p. 1575.

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INVESTIGATION OF THE FRAGRANCE DURABILITY OF KNITTED FABRIC BAND COATED BY EUGRARIT RSPO MICROCAPSULES CONTAINED THE CINNAMON OIL ESSENTIAL

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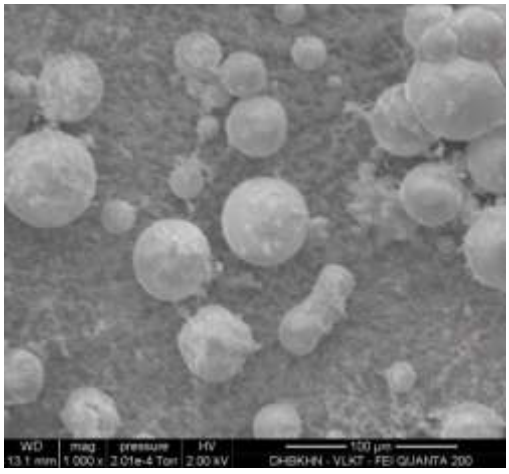
The aromatherapy textile of cinnamon oil comes from a compound found in the essential oil called cinnamaldehyde. With the antibacterial and anti-inflammatory properties that can help treat certain metabolic, infectious, digestive or respiratory disorders, this compound is also very volatile. Moreover, cinnamon essential oil can help treat dermatitis, but the coumarin compounds found in essential oils can cause skin irritation. Therefore, encapsulation is currently the best solution to improve evaporation and keep the fragrance of essential oils on fabrics longer and reduce large amounts of pure essential oils in direct contact with the skin. In this study, we have investigated the odor fastness of Eugrarit RSPO microcapsules contained the cinnamon essential applied to the surface of interlock fabric knitted by Chief Value Cotton (CVC) yarn (60% cotton, 40% polyester). The fragrance durability of the knitted fabrics coated by pure cinnamon essential oil and the microcapsules contained cinnamon essential oil had been evaluated. The influence of the pressure of knitted fabric band coated by the microcapsule contained cinnamon essential oil induced by extension levels of 21.25%, 57.5%, 68.75%, 83.75% had been studied. The fragrance durability evaluation was based on the combination of the expert method and diluted solution method. The results showed that the fragrance intensity of knitted fabrics treated by pure essential oil was stronger but the diminution of their fragrance was faster than these ones treated by the cinnamon essential oil microcapsules. Besides, the higher the extension applied on the fabrics band, the smaller their fragrance intensity had been maintained. The problem of long-term retention of essential oil on the fabric surface for the purpose of preserving fragrance or promoting the necessary properties of the essentiel oil for a long time was one goal of the works. Cinnamon essential oil contains many healthful compounds but it is quickly evaporatetes and coumarin compounds easily cause skin irritation when exposed to large amounts of skin. Using microencapsulation in this study showed the good effectiveness of microcapsules contained the cinnamon essential oil for long-lasting fragrance on the fabric. Fragrance intensity of microcapsules contained the cinnamon essential oil was showed decreasing with the higher compressive force corresponding to the larger extension applied on the fabric band. Lberation of the active agent such as essential oil from the microcapsules coated on the knitted fabric band could be controlled by fabric extension. The results could be applied on the therapy textile field and medical textile as compression garment.



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Keywords: Microencapsulation, fragrance textile, healthcare textile, interlock knitted fabric, fabric extension.

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INVESTIGATION OF THE PROPERTIES OF TEXTILE MATERIAL WITH HYDROGEL CONTAINING ZINC OXIDE PARTICLES

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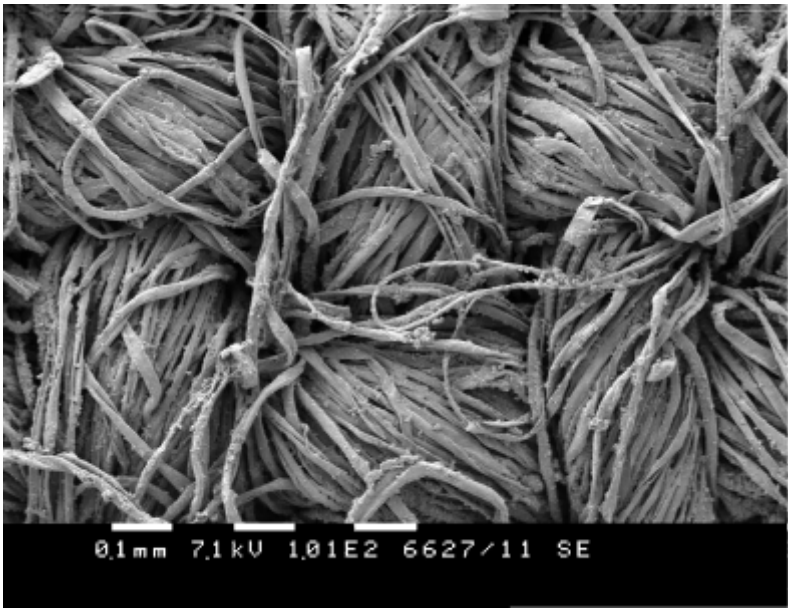
Microbial growth on textile fabric causes a number of changes in appearance - discoloration, loss of strength and elongation, bad smell. As a result of microbial adhesion to the surface of an infected textile material, it can cause undesirable consequences, lead to clinical complications and even death. Natural organic fibers such as cotton, linen and wool are easily attacked by microorganisms. This requires modification of their surface through chemical, physical or biological treatment in order to provide antimicrobial protection and prevent their spread.

In this study, an attempt was made to improve the properties of cotton fabric by impregnating it with gelatin hydrogel cross-linked with glutaraldehyde and containing ZnO nanoparticles. Three methods of ZnO synthesis were investigated by varying the components and processing conditions. The *in situ* method for obtaining ZnO nanoparticles on the surface of cotton fabric was successfully applied. The composite materials were examined by means of SEM, spectrophotometric analysis using UVA/VIS/NIR, and air permeability.



Morphological analyzes show the presence of spherical ZnO particles that have changed into a flower-like form. In other samples, the particles are covered by the collagen film, and in others, they are scattered and agglomerated in certain places. The immobilization conditions and different synthesis sequence were found to affect the particle shape and morphology of the hydrogel on the cotton fabric surface. It has been proven that the composites obtained by one method show the best characteristics and promising results for antibacterial properties, which are the subject of future research. It is necessary in further research to characterize the biological properties of the obtained composite materials, as well as their possibility of use as an antimicrobial material. The cotton–gelatin–ZnO NPs biocomposite can be very effective for use as wound dressings, absorbing wound exudates and providing a perfect moist healing wound environment protected from the effects of microorganisms.

Keywords: *biocomposites, cotton, gelatin, ZnO nanoparticles*

Topic № 2
TEXTILE TECHNOLOGIES: SPINNING, WEAVING AND KNITTING

677
Textile Industry.
Technology of textile materials.


ТЕХНИЧЕСКИ УНИВЕРСИТЕТ
СОФИЯ


ТЕХНИЧЕСКИ УНИВЕРСИТЕТ
ТУ ГАБРОВО
ГАБРОВО


ПРОФЕСИОНАЛНА ГИМНАЗИЯ ПО ТЕКСТИЛ И ОБЛЕКЛО
ДОБРИ ЖЕЛЯЗКОВ

https://doi.org/10.53230/tgm.1310-912X.2022.0010.15

BALLISTIC IMPACT RESPONSE OF TEXTILE MATERIALS - A REVIEW

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Protection from different kinds of threats, such as sharp objects and ballistic projectiles, dates back to the history of humankind. People were wearing protection equipment made of different kinds of primitive materials to protect themselves from various kinds of threats. Various textiles made of traditional fibers such as linen, cotton, silk, and nylon have been used for garments but also as protecting materials against threats. In the late 1960s, high-strength, high-modulus fibers were invented to support the new era of protection by developing body armor systems against different ammunition. That was be followed by the development of different trade marked synthetic fibrous materials with anti-ballistic performance.

Modern armies and law enforcement agencies use body armor consisting of an outer tactical vest (OTV) with inserted hard ceramic insert to stop the high-speed rifles, handguns, and soft armor plates to stop handgun projectiles and reduce ballistic impact consequences. Even though armors with heavier inserts are essential to protect against armor-piercing, they also result in excessive weights in the armour system, affecting a soldier's mobility in the field. Today, the current technology-driven military operations and on-street sophisticated weapons and ammunition impose the development of advanced damage-resistant, flexible, lightweight, and huge energy-absorbing ballistic protection armor systems based on soft materials.

Due to these trends, various high-performance fiber types have been developed. Para-aramids and ultrahigh molecular weight polyethylene (UHMWPE), Twaron®, Kevlar®, Dyneema®, and Spectra® are among the well-known high-performance fibers extensively used for flexible personnel ballistic protection armor. Zylon (Toyobo), Spectra®, M5 Vectran, and Nextel are also used. Those developed high-performance fibers possessed a unique performance, and these fabrics' ballistic impact response mechanism is different from the traditional fibers and even each other.

Ballistic impact mechanism is a complex mechanical process that mainly depends on the target material's thickness, strength, ductility, toughness and density, and projectile parameters. The developments of high-strength, high-modulus fibers have led to using fabrics and their composite laminates for various impact-related applications. The different influential mechanisms and factors that affect the target's ballistic impact performances also impose experimental research work and different analytical, numerical modeling, and empirical techniques-based research approaches.

This paper provides outline and discussion regarding mainly different types of ballistic textile fabrics and composite materials and their ballistic impact response, which affects the ballistic impact resistance performances. To do that, this review paper first outlines various ballistic soft materials involved in the ballistic applications, including body armor. Besides, various approaches used for a understanding of the ballistic impact mechanisms and responses of the textile ballistic materials will be examined.

Keywords: ballistic textile fabrics, equipment, body armor

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COMPARATIVE DESCRIPTION OF THE DEFECTS IN THE APPEARANCE OF THE FABRICS

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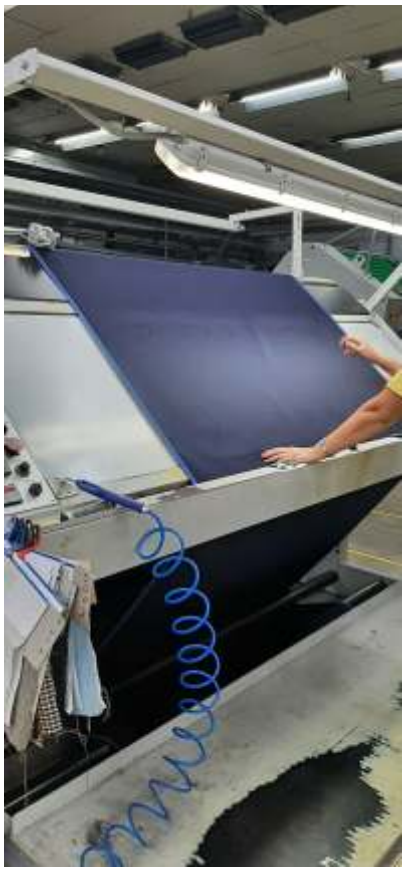
Garments are an integral part of our daily life. They should be not only fashionable, but also practical and comfortable. The comfort of our clothing is taken care of by the designers and technologists who recreate the constructive solutions of the model in comfortable fashion collections. Operators in textile production, textile technicians and fabric designers are responsible for the quality of textile surface products. But the most important thing is that the fabric from which the garment is made should be produced in good quality.

In the specialized literature, there are known sources that consider defects in the appearance of fabrics. On the one hand, these are textbooks and monographs, and on the other hand, standards and other normative documents.

As part of the overall quality of fabrics, defects in appearance occupy a special place.

The other properties such as areal mass, strength or surface resistance are due to the machine settings of the textile machines and appear as deterministic functions of the interplay between the working organs and the textile raw materials. For example, the areal mass of a fabric depends on the linear density of the weft and the weft packing. These properties are probabilistically described by a normal distribution.



Defects in the appearance of the fabrics are due to sudden and accidental breakdowns in the machines that go out of the normal mode of operation.

They appear as rare events and are described by random functions of their distribution.

The random nature of the reasons for their appearance and the determining importance for the quality of the fabric require a strict definition of the defects as causes, type and impact.

In the known literature, defects in appearance are presented with extensive descriptions but no classification, or with names resembling technological jargon and a narrow local distribution. In any case, it is periodically necessary to update the description of the defects and their reference to modern textile techniques.

The subject of the article is the description of defects in the appearance of fabrics according to the type of fabrics: woven or knitted, according to the technological stage: spinning, weaving, knitting, dyeing and finishing, and according to the impact on the general quality of the sewing products.

The purpose of the development is the compilation of a modern catalogue with the main defects and the corresponding description, as well as the necessary references for prevention and impact assessment.

Tasks include literature research, technological observations, specimen collection, cataloguing and description.

Keywords: quality, fabrics, defects, appearance, catalogue

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PROMISING CONCEPT FOR HAND WEAVING WITH ECONOMIC APPLICATION IN MASS PRODUCTION

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Hand weaving is a textile technique in which the interaction between the weaver, the loom and the threads is carried out by the human body, without additional sources of propulsion. Nowadays, hand weaving exists in three main directions.

In the first place is the craft weaving, which takes place in ethnographic museums and its main purpose is the preservation of local knowledge and skills in hand weaving. In second place is artistic weaving. It takes place in creative studios and aims to produce unique textile art products with artistic value. The third direction is educational weaving. Its main purpose is to show the weaving technique as a principle and as a process with the possible separation of certain stages, movements and interactions. Hand weaving for educational purposes combines three features. The looms are made in different versions according to the level of the trainees, but are generally simplified in terms of construction and materials. The essential feature is in the group implementation of educational weaving, or - its partial/limited mass.

The subject of this article is the idea of a balance between a cheap and light hand horizontal loom with simple operation, allowing for personal creativity, ergonomic, allowing 45-60 minutes of continuous work, having clear mechanical action and predictable productivity. The purpose of the development at this initial stage is to indicate the main principles and guidelines in the development of a hand weaving project with a manufacturing application. The tasks are primarily focused on literature research and gathering information and facts on the matter.

The disadvantages of the currently common handlooms are divided into three groups: structures and materials, technological possibilities and ergonomic conditions.

1. Construction and materials: constructions with 19th century carpentry techniques, unstable structures with unstable fixed and movable connections and large clearances, contact surfaces: thread/organ have high friction and low wear resistance, application of stretch/elastic rope ties to manage the warp threads in forming the shed, contact surfaces of the working bodies with the threads with high wear resistance and low coefficient of friction, special, single constructive solutions, closed constructions without the possibility of improvement, upgrading and easy replacement of working bodies and parts.

2. Technological disadvantages: Impossibility of mass reproduction of uniform fabrics of constant quality, limited builds with fitting and handling of up to 4 heddles frames and inability to reproduce weaves with a repeat greater than 4, non-functional and underdeveloped working organs: take-off brake, attractive cross, width holders and shade frames with the reed, absence or subordination of auxiliary devices: shuttles, spinning wheels, pulleys, bobbins, etc., insufficient ergonomic functionality in modern conditions, large resistance forces for driving, due to high friction between the working bodies, absence of an ergonomic workplace to ensure a comfortable posture for the weaver.

Requirements:

1. Universal construction relative to: the weaver, raw materials, fabrics and loom reproduction.
2. Saving the wood for contact with the weaver and weaving auxiliaries.
3. Ease with minimal load when performing the weaving cycle, possibility of constant, rhythmic work for 45-60 minutes. Distribution of efforts of the limbs and musculature of the weaver. Ability to maintain uniformity in effort and in packing.
4. Ease and convenience in auxiliary operations: winding, twisting, spooling and warping.
5. Drive by human power only.
6. Possibility of improvement by upgrading with modules from plain weaving loom to loom for lobby and jacquard fabrics.
7. Possibility of manufacturing unification of 3-6 looms in one hall.
8. Possibility of manufacturing reproduction of mass quantities.
9. Preservation of opportunities for unique creative solutions in weaving.
10. Unification in homogeneous quality.
11. Low cost and affordable price.
12. Durability and durability of weaving equipment.
13. Preservation of traditional techniques and good weaving practices.
14. Perspective: manufactory, no workshop.
15. FSC, FairTrade, GRS, safety and similar certification.

The forward-looking concept **ProConWeaving** is looking for solutions for the application of hand weaving in mass production, with preserved possibilities for **original solutions and unique effects**.

1. Basic construction: stable, with the necessary inertial mass and a low centre of gravity, Functional independence of the working bodies, upgrade options, modular construction principle.
2. Selection of materials: different types of wood according to the functions of the machine elements, the surfaces of the working organs in contact with the human organs must be made of wood, working bodies in contact with textile materials - as appropriate, modern construction materials for the fixed joints.
3. Removable links: modern construction materials, modern machine elements, replaceable spare parts, Possibilities for automation.
4. Accompanying activities: development of constructive documentation and protection of intellectual property, compilation of teaching aids and training of weavers and technicians.

Keywords: textile, hand-loom weaving, perspective concept

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TECHNOLOGY OF GREASY WOOL PROCESSING QUALITY CONTROL

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"Lempriere Wool" EOOD, Sliven, Bulgaria is one of the largest wool traders and processors in the world with the most diversified portfolio, including a wool tops production plant that began operations in 2016 in Sliven, Bulgaria.

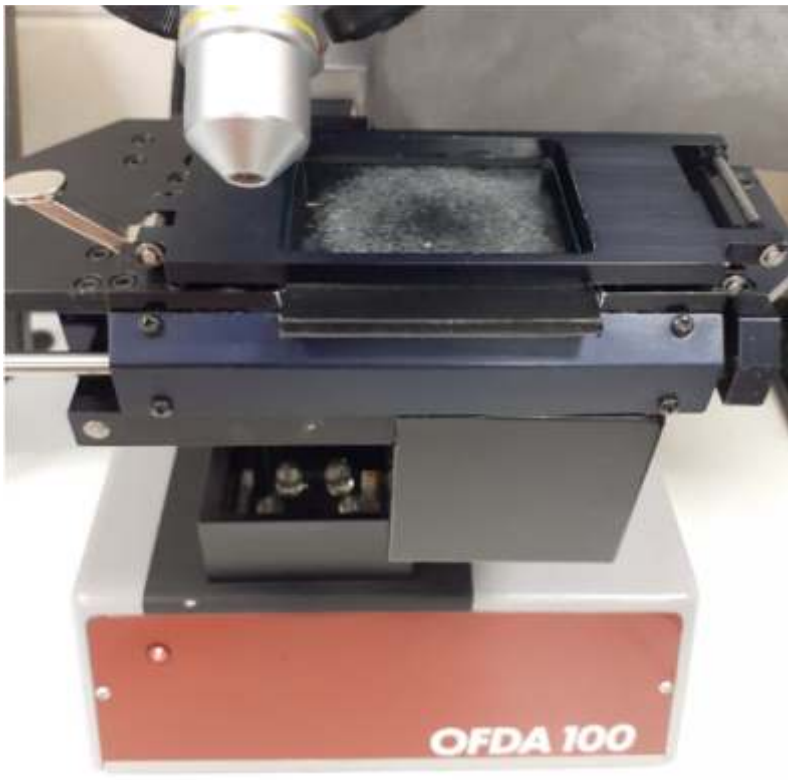
As co- products, the company produces wool open tops, wool cut tops, wool noils (in raw white and bleached), as well as wool grease- lanolin. Lanolin is the natural fat of the wool fiber and is extracted in the process of scouring the greasy wool. It is used in the cosmetic and pharmaceutical industries.

Description of the technological process: 1.Dissolving and blending the greasy wool, 2. Scouring line: Soaking, Actual scouring (this is where the lanolin extraction takes place), Rinsing, Drying, 3. Oiling with lubricant, 4. Carding, 5. Gilling and oiling with antistatic- 1st, 2-nd and 3-rd passage, 6. Combing, 7. Gilling, 8. Bumps press, 9. Packing

Quality Control Plan

Procedures for performing laboratory analyses: Average length measurement, Measurement of average fineness-OFDA and Air-Flow, Wool sliver weight measurement,

pH measurement, Measuring the evenness of the wool sliver, Moisture content measurement, cleanliness control - presence of slubs and neps, as well vegetable material, Control for the presence of colored, medulated and kemps fibers, Determination of fat content by the Soxhlet method, Measure the color of the wool tops, Determining the concentration of Hydrogen Peroxide during bleaching, Ash content.



Moisture contents in lanolin, also acid value, free fatti acid value.

By implementing a quality control system and maintaining standards such as OEKO- TEX, EU Ecolabel, GOTS, RWS, Inditex and Interwoollabs, our organization strives to satisfy the expectations of all customers.

Keywords: greasy wool, lanolin, wool slivers, quality control, certificates

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ANALYSIS OF THE POSSIBILITIES FOR EFFECTIVE USE OF TEXTILE RESOURCES

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Abstract: The textile sector is one of the significant environmental pollutants. It uses a lot of raw materials and leaves piles of textile waste around the world. Their accumulation is becoming a global problem, and their elimination is one of humanity's biggest challenges. The 10% of carbon emissions, released into the atmosphere, is due to the fashion industry, and to the finishing treatments (dyeing, laundry, etc.) - about 20% of the pollution of fresh water in the world. Annually in Bulgaria, 170 thousand tonnes of waste from old clothes and shoes are "created" as a result of fast fashion, over-consumption, shorter clothing life, global population increase, and affordable clothing prices [1,2,3]. More than 60% of modern clothing contains synthetic fibers that are not bio-decomposed. They have a long breakdown period and fall into nature forming huge piles of waste, and in the water spaces – microfibers [6]. The purchased new clothes in the EU reach quantities of 6.4 million tonnes a year. For the last 25 years, one person's purchased clothes have grown by 40%. The average consumer today buys 60% more clothes and uses them 50% shorter time than 15 years ago [2,7]. Textile waste in the EU-27 and Europe is expected to increase from 7.0-7.5 million tonnes in 2020 to 8.5-9.0 (gross) in 2030 [8]. Textile waste can be seen as industrial and waste of life, respectively generated in the production of textile products and in their consumption by humans. Denim products are the most widespread in the world and at the same time some of the most mass textile waste. They are also the most preferred used processing items in a new type of products. Unique new products are sewn from old denim clothing to extend the „life" of textile material and reduce domestic waste.

This study analyzes the possibilities for the effective use of textile resources. A technology for prolonging the life cycle of textile material fabric \"denim\" is proposed through re-use as a new product: a sports bag has been created from jeans. The parts of the jeans are processed in a way that the minimum loss from the fabric remains. The pockets of jeans are sewn like pockets of the bag without modification. Thus, the decorative threads are saved and the consumption of threads was reduced.

Keywords: textile, reuse, denim, new clothes, sport bag.

Reference

[1] Koszewska, M. O. Rahman, B.Dyczewski, Circular Fashion - Consumers' Attitudes in Cross-National Study: Poland and Canada, August 2020, Autex Research Journal 20(3):327-337

[2] Angelova, Y.P.,Sewing industry and the challenges of the circular economy, Tekstil I obleklo, vol. 5 2020, pp 170-178

[3] Balinov, B., Circular economy and sustainable development, Management and sustainable development 4/2018

[6] Less textile waste - cleaner air and more health, Trud online, 07.11.2018 (accessed 10.06.2021)

[7] The circular economy - a tool for rapid recovery, https://texcycle.bg/circle-economyweb/ (accessed 20.05.2021)

[8] Hedrich, S, J. Janmark and et al., McKinsey & Company,Scaling textile recycling in Europe-turning waste into value, www.mckinsey.com/industries/retail/, July 14, 2022

Topic № 3
APPAREL TECHNOLOGY

745/749
Applied Art
Art Crafts
Interior
Design

Topic № 4
TEXTILE ART AND FASHION DESIGN

658.512.23
Artistic design
(industrial design).

НАЦИОНАЛНА
ХУДОЖЕСТВЕНА ГИМНАЗИЯ
•ДИМИТЪР ДОБРОВИЧ•
СЛИВЕН

ПРОФЕСИОНАЛНА ГИМНАЗИЯ ПО ТЕКСТИЛ И ОБЛЕКЛО • ДОБРИ ЖЕЛЯЗКОВ •

Национален музей
на текстилната индустрия
Сливен

https://doi.org/10.53230/tgm.1310-912X.2022.0010.20

СТИЛОВЕ В СЪВРЕМЕННОТО ДЕТСКО ОБЛЕКЛО

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The question of style in modern children's clothing can be seen as part of the wider topic of children and style. This point of view applies to all areas related to the practical application of styles in the children's environment such as clothing, design and architecture. Style in children's clothing has several main roles. They are aesthetic, constructive, psychological, pedagogical, symbolic and sign-communicative. It is not by chance that the term "style" is associated as a term for various areas of human knowledge, behavior, as well as for communication with the surrounding world.

The relationship between style and fashion is obvious, although style appears to be a more persistent and significant aesthetic criterion for clothing. This is a fact because style is not just the external appearance, it is above all an expression and consequence of the inner peace, feelings, aspirations, ideas and behavior of each young individual, through the prism of the parents' views on aesthetics and taste. Many different styles are emerging in modern fashion for adults and children, but some of the most popular are: classic, romantic, sporty, casual and denim. These basic styles are also characteristic of children's clothing, of course, developed through the prism of the requirements of this segment of fashion.

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TEXTILE IN THE INTERIOR THE CEILINGS

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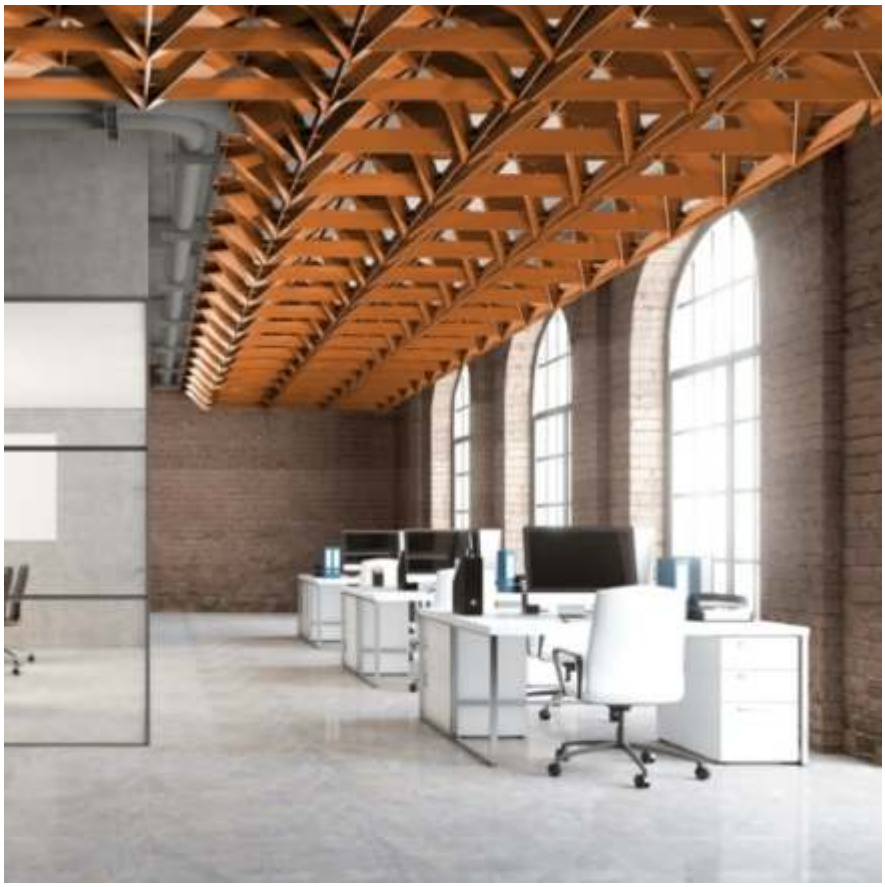
For millennia, textile has had its well-deserved and irrevocable place in the layout of interior spaces. It is presented in various forms, fulfilling a variety of functional and aesthetic roles. Walls, windows, floors, furniture, and lighting fixtures could be covered with textile. Not infrequently it is a main material in the construction of elements which are a part of an interior, but in some samples, older than a few decades, we see it as a material for a ceiling solution.



The ceiling is an extremely important room part. Compared to the other elements – walls and floor, its area remains mostly visible and uncovered by furniture and accessories. Often its role is underestimated even by designers and architects, but it is an important factor in the lighting quality, acoustics, compositional integrity, soundproofing and thermal insulation. The ceiling area is also a great field for expressing decorative and aesthetic ideas. From the interior design point of view, the ceiling has no longer been only a part of the vertical finish of a space or an ordinary background for the lighting fixture.

The report examines the possibilities for the application of textiles in this very important part of interior architecture. It tracks and analyzes various design solutions, constructive and technological approaches, considers that modern design has the privilege of benefiting from both traditional and established application models, as well as from modern and newly emerging technologies and opportunities.

Keywords: textile ceilings, stretch ceilings, acoustic panels

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APPROACHES TO THE DESIGN OF FLEXIBLE STRUCTURES FOR TEXTILE AND SURFACES MANUFACTURED BY 3D PRINTING: A REVIEW OF TENDENCIES,

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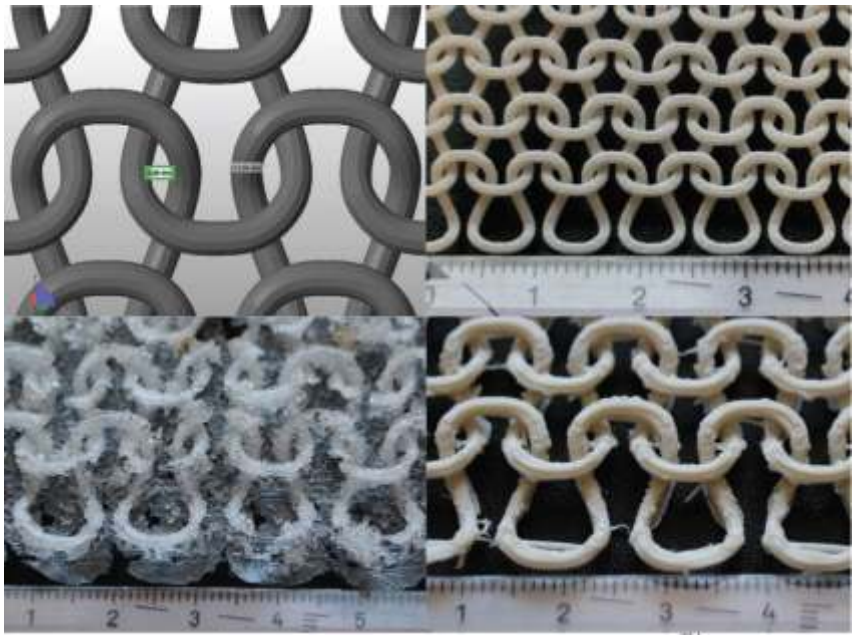
3D or three-dimensional printing is a technique for creating three-dimensional objects in which a computer-designed object is created by adding material layer by layer. This technique is used in fields such as medicine, architecture, design, etc., including in the design of textiles and surfaces.

The process of creating three-dimensionally printed textile structures differs from traditional notions of textile as a product obtained by weaving, knitting, etc. fibres of vegetable, animal, synthetic or other origin. The materials used for 3D printing are predominantly synthetic polymers and some types of natural polymers, which allow the creation of hard-to-the-touch surfaces and textile structures. These and other features of 3D printing are simultaneously challenges and a tool for creating surfaces and textiles with alternative aesthetics and functionality.

There is a variety of design approaches for the creation of textile structures using 3D printing, e.g. the imitating of traditional textile structures such as weave and knit; or creation of structures composed of connected elements similar to the historic metal chain mail. Another approach is the creation of structured sheet surfaces of different thicknesses, whose structure changes with movement and thus provides elasticity and flexibility characteristic of textiles. To bring the three-dimensionally printed "textile" closer to the feel of traditional textiles, the two can be combined by 3D printing of two- and three-dimensional patterns, structures and elements onto traditional textiles.



This review of the current tendencies aims to analyse the relationship between material, structure, function and aesthetics in the design of textiles and surfaces using the 3D printing technique. The basic systematisation and classification of strategies for the creation of textile-like feel of thus created surfaces reveals various approaches to transform otherwise hard-to-the-touch materials into flexible and almost "soft", "liquid" structures.

Keywords: industrial design, 3D printing, applied arts

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STRUCTURE AND COLOUR IN THE DESIGN OF TEXTILES AND SURFACES: FROM NANO-STRUCTURES TO MACRO-STRUCTURES

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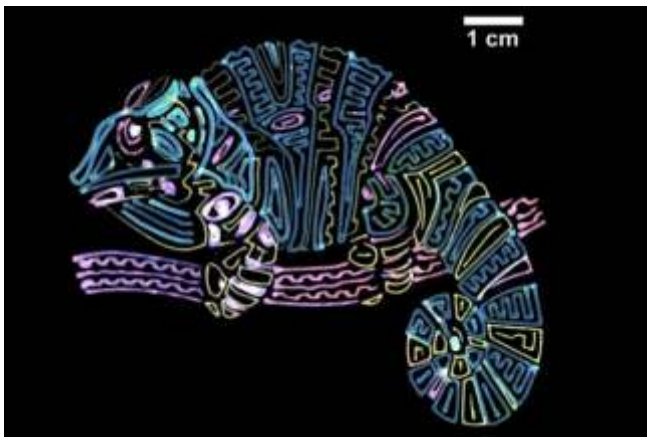
Colour is an essential component of the design of almost all man-made products. The creation of colour in textiles and surfaces has traditionally been achieved by the addition of pigments and dyes, and in some cases by decolourisation. Some of the pigments, dyes, discolouring agents and auxiliary materials are toxic. Industrial dyeing processes can be harmful to both the people involved and the environment. Colours achieved through dyes are often unsustainable over time, affecting the production and consumption cycles of textile products.

Is it possible to achieve colour without pigments and dyes?

In nature, many colours are due not to pigments but to the nano- and micro-structuring of the materials. Examples are found in many insects such as butterflies and beetles, plants, iridescent substances such as opals, crystals, pearls, etc.



Today, this type of nano- and micro-structures are the basis of a number of practical studies in the field of nano-technology, aiming to create new methods for permanent structural colouring of textiles and surfaces. The idea is to achieve methods for environmentally sustainable colouring by structuring the textile building materials themselves or by nano-structured coatings on textiles.

The term "structural colouring" means the creation of a variety of colours and optical effects at a visible level through invisible micro- and nano-structures. Another interesting interpretation of the term "structural colouring" is the creation of an optical effect resembling iridescence by combining pigment-coloured elements and visible macro-structures. This type of visual effect comes from techniques such as lenticular printing. Today, 3D printing technology allows for the addition of macro-structures to traditional textiles in order to achieve intriguing aesthetics through eye-catching optical effects.

This paper aims, through a review of recent developments for structural colour creation from the nano-level to the macro-level, to analyse functional and aesthetic aspects of the relationship between colour and structure that inspire new ideas and methods for textile and surface design.

Keywords: industrial design, textiles, colours, textures, applied arts

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ZERO WASTE FASHION DESIGN - A REVIEW

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Abstract: In the last 3 decades the fashion industry has become a complex, fragmented, global system. At its core, this industry constantly encourages the consumption of the "fashionable" and the discarding of the old. It has resulted in a negative impact on the environment and the people at the bottom of the supply chain - the clothing and textile manufacturers.

The "Zero waste" strategy is an ethical, economic, effective and visionary goal to change habits and lifestyles along the lines of sustainable natural cycles, where all waste materials are intended to serve as raw materials for other processes. “Zero waste” has a goal of design and managing products and processes in a way that systematically limits the volume and removes the toxicity of waste and materials by conserving and recovering all raw materials rather than incinerating or landfilling them.

The use of "zero waste" as a method in fashion design has been developing over the past ten years. Its main goal is to develop fashion designs with no cutting residue. Although it has been a method used since ancient times, today it is preferred for sustainable purposes. Zero waste fashion design does not necessarily mean that we have to stop making clothes to reduce waste. Professionals and researchers in the fields of fashion design and pattern making develop existing approaches, creating new zero-waste design technics. In at its core, the process is a plan-driven process with fabric manipulation and hands-on training of the designer.

The paper presents contemporary examples of zero-waste fashion designs with an emphasis on the work of designers and their efforts to minimize waste material in cutting. The designers’ used approaches and their creative solutions of creating zero waste fashion designs have been studied and analyzed. The results of analysis can be used directly in creation of new zero or minimizing waste fashion designs.

Keywords: sustainable fashion, zero waste fashion design, zero waste pattern making.

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BUILDING A SUSTAINABLE FASHION BRAND

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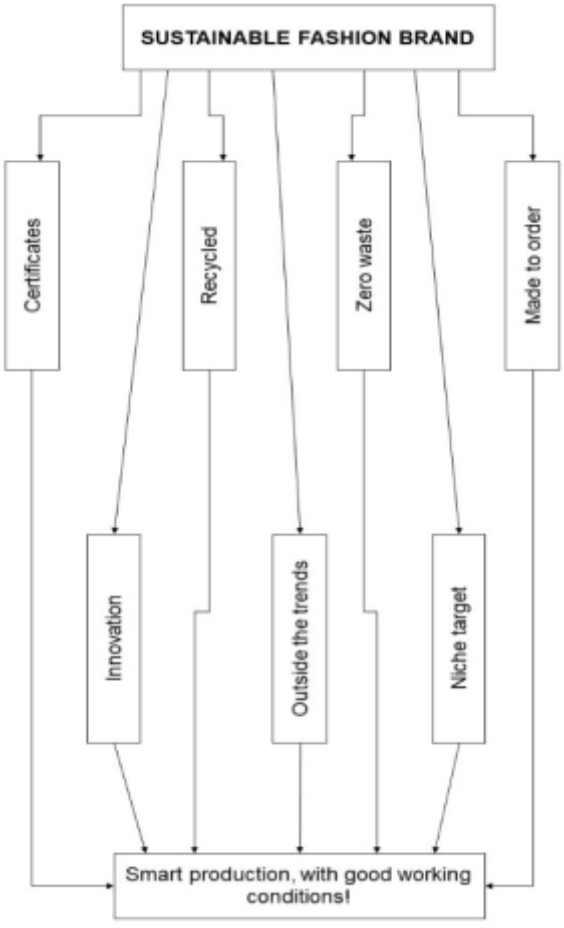
The emergence of slow fashion, ethical fashion or sustainable fashion is a natural extension of the giant movement in the fashion industry. Throughout the 20th century, every ten years we have a radically different visual state of fashion. At the end of the 20th century and the beginning of the 21st century in the fashion industry, visual changes are every season - radically different designs, radically different silhouettes, textures and details. This encourages consumers to consume more and more products, which is directly proportional to the discarded products. This dynamic cycle is completely influenced by the fashion trends that change every season and this accelerates the industry and consumption more and more.

The creation of designer fashion products outside of trends is based on two principles. One is the distinctive stylistics of the fashion designer, who creates an individual, distinctive design, fully aligned with the distinctiveness of the brand, and not with any trend. The other is the clothes that have become classics. These garments never go out of style and always look good in one's wardrobe.

Building a sustainable fashion brand today is characterized by several factors.

- The materials from which the author's products are manufactured must be certified with certificates.
- Its production should be with optimal use of the resource.
- The production materials are recycled.
- Production should be Zero waste.
- The production should be made to order.
-The design is patented for sustainable innovation.
- The design should be outside the trends.
- The positioning of the fashion brand should be niche.
- Production should be small or medium, with good working conditions.



For a fashion brand to be sustainable, it must meet one or more of these factors. The more they are, the more stable the fashion brand is. The clearly laid out structure in building a fashion brand with sustainable contemporary positioning, adapted in the modern digital distribution of the fashion industry, leads to great qualitative results for realization in the XXI century.

Keywords: sustainability, brand building, zero waste, recycled, slow fashion.

Topic № 5
TEXTILE MACHINERY AND EQUIPMENT

677
Textile Industry.
Technology of textile materials.

https://doi.org/10.53230/tgm.1310-912X.2022.0010.26

DEVELOPMENT OF A STAND FOR STUDYING THREAD TENSIONS WHEN KNITTING HYBRID LINEAR TEXTILE PRODUCTS OF THE "FETUCCIA" TYPE

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The high speed of the spinning machines generates a lot of friction and thus additional heat is given to the yarn and as a result - the moisture in the yarn evaporates. Dry fibers have reduced mechanical resistance and this worsens the technological applicability of the yarns. Wool fibers have the widest application in the production of yarns and are distinguished by the most complex fiber structure.

In the hybrid technique for knitted yarns – braided cords, two mechanical effects are applied at the same time: twisting of the fiber bundle and looping to weave the cord. Twisting has a constant intensity of impact on the fibers, but looping is cyclic in nature. The sinusoidal variation of the strains in the thread induces cyclically variable stresses that have a major impact on the quality of the hybrid thread. Strains depend on the setting of the knitting head, but stresses can be measured at the input and output of the process.

In a preliminary experiment, the influence of the combinations of different components in the knitted yarn on its appearance and the quality of knitted fabrics, as final products, was investigated. Yarns of two linear densities, 18 and 25 tex, with different composition - wool type, were made. The yarns are spun in a worsted spinning mill of the company "E. Miroglio" EAD. The production of the yarns takes place according to a spinning plan, which includes the necessary data for obtaining the physical and mechanical indicators and the sequence of technological processes.

The subject of this article is a concept of electronic control of the knitting cycle, which consists of: sensory control of the tension of the knitting thread when forming the loop, visualization of thread stress on display, avoidance of stresses and deformations above the elastic limits, reduction of the difference between the minimum and maximum tension of the threads in the knitting cycle, maintaining constant tension in the threads during successive knitting cycles.

The purpose of the development is a block diagram of electronic control of the knitting cycle: sensor - strain gauge, converter, processor, control of the speed of the knitting head, adjustment of loop rows, control program and display. The development of a stand for electronic monitoring and control of a hybrid spinning-knitting head is interdisciplinary in nature: textile materials technology and process automation. The stand can be used in: technological optimization of new products of the "Fetuccia" type and as a didactic tool in the training of textile specialists.

The tasks to be performed are: literature research, making of the stand and description of its functioning.

Keywords: braided cord, knitting head, electronic monitoring

Topic № 6
TEXTILE MANAGEMENT, MARKETING AND SUSTAINABILITY

33
Economics.
Economic sciences.

ЮГОЗАПАДЕН
УНИВЕРСИТЕТ
·НЕОФИТ РИЛСКИ·

ТРАКИЙСКИ УНИВЕРСИТЕТ
СТАРА ЗАГОРА

ИНСТИТУТ ПО ОТБРАНА
„Професор Цветан Лазаров"

https://doi.org/10.53230/tgm.1310-912X.2022.0010.27

TEXTILE AND FOOTWEAR PRODUCTS AS SUSTAINABLE RESOURCES FROM RENEWABLE SOURCES TO ACHIEVE DECARBONISATION AND STRENGTHEN THE CIRCULAR NATURE OF THE PRODUCT LIFE CYCLE

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In September 2015, world leaders adopted the UN Agenda Transforming our world: The 2030 Agenda for Sustainable Development, establishing a set of Sustainable Development Goals (SDGs) to end poverty, protect the planet, ensure the protection of human rights and guarantee prosperity for all. The adoption of this Agenda marks a historic shift towards a new paradigm by addressing economic, social and environmental disparities in a universal and integrated way. This process fully reflects the European values of social justice, democratic governance and the social market economy, as well as environmental protection [6].

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016 [5].

The Agenda and the Paris Agreement on climate change provide a roadmap to a global framework for international cooperation on sustainable development and its economic, social, environmental and governance dimensions [1].

The European Commission adopted the new circular economy action plan (CEAP) in March 2020. It is one of the main building blocks of the European Green Deal, Europe's new agenda for sustainable growth [2].

The new action plan announces initiatives along the entire life cycle of products. It targets how products are designed, promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible [2].

The European Commission has identified seven key sectors for building the circular economy. These require changes at different stages of the chain, from design through production to use by end users [7].

This article examines the textile and footwear industry as a major sector of EU industrial production.

The textile sector ranks third in the world in terms of water consumption [3].

In order to assess the nature of the problem in this sector, it is necessary to examine the different stages of the life cycle of textile and footwear products and to identify the factors adversely affecting circular economy processes, sustainable consumption and waste prevention.

Keywords: European Commission, Sustainable Development, textile and footwear products, life cycle

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EVENT DESIGN IN THE FASHION INDUSTRY

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Today fashion and design are the main forces in the development of society in a cultural and business aspect. In recent years, fashion as communication, industry and art have also developed thanks to various events. Those events are becoming more and more important and complex in terms of functions and goals - they are a meeting place, they are creativity at the highest level, they help economic development, create communities and events that are a social mediator, they are business forums and are also held in the virtual environment. According to researchers and practitioners, events in the new century have a new focus that complements and precedes logic and operational planning. According to Brown [1], today they require first design, as a process preceding all others - objects of management for the realization of an effective event. More and more often we talk about event design, design based on research solving business and society problems with a human focus, and which leads to the realization of events, not only as a communication element of business, not just advertising or part of a marketing plan, more importantly, event design adding value and events with content leading to a positive impact for all participants.[2] This makes design an integrative and fundamental activity that precedes all others in time and remains relevant. The focus is not just about designing the visuals. Design today, with its recognized importance not only for the creative industries, is changing business and the creation of many new business models in fashion.

The article outlines new perspectives in event management and the role of design, as well as the importance of design thinking and design management. The development and importance of events in the fashion industry are in focus, revealing a new understanding of event design. The typology of events in fashion and the innovative approaches in their realization are examined. In the context of contemporary challenges in the textile and clothing sectors, fashion trends and new business approaches, fashion events and experience design are emphasized as key design challenges. The key event design concepts are adding value and analyzing the sustainable development of the entire fashion system. The relationship between fashion events and events using fashion, between the cultural and business functions of the events is clarified and the paper ends with the author's conviction- the focus of every event design and event management process must be the person - creator and co-designer, client and user, spectator and participant within a modern and efficient event and experience.

Keywords: design, events, fashion industry, design management, event design

References:

1. Brown, S. (2005) 'Event Design: An Australian Perspective', Paper presented at the 2nd International Event Management Body of Knowledge Global Alignment Summit in Johannesburg, South Africa, July 2005. https://fhrc.flinders.edu.au/research_groups/edrn/Brown-Event-Design.pdf

2. Orefice, C. (2018), "Designing for events - a new perspective on event design", International Journal of Event and Festival Management, Vol. 9 No. 1, pp. 20-33. https://doi.org/10.1108/IJEFM-09-2017-0051.

https://doi.org/10.53230/tgm.1310-912X.2022.0010.29

NEW TECHNOLOGICAL DEVELOPMENTS AND METHODS FOR CREATING ENVIRONMENTALLY FRIENDLY PRODUCTS

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Fashion is a global industry worth over 1.2 trillion dollars and employing over 60 million people. This puts it at the forefront as one of the most polluting industries in the world and the third largest consumer of water globally. The fashion industry also accounts for around 10% of global carbon emissions. Against this backdrop, the European Economic and Social Committee (EESC) is concerned that less than 1% of textiles worldwide are recycled into new products. The growing global consumption of clothing and fashion goods requires a rethinking of values and action to reduce the social and environmental impacts of the fashion industry. The economics of textiles should undergo many changes aimed at incentives that encourage the recycling of textiles, as well as the creation of new technological developments and methods for environmentally friendly products and environmental protection.

This report examines some of the latest proposals and innovations in textiles related to modern methods of minimizing the impact of the textile industry on the environment. It covers the product development process from the entire supply chain and the production of fibers and materials, to the production of clothing, footwear and accessories – their distribution, use and disposal or recycling. In March of this year The European Commission has adopted a Strategy for Textile Recycling and Reuse, focusing on the creation of textile fibers obtained from textile recycling or making polyester from recycled plastics. The strategy initiates serious transformations in the textile industry, both in the short term and in the longer term plans. Some of them are:

• ban on destruction of unnecessary and returned textile products in order to reduce overproduction and overconsumption;

• creation of textile recovery organizations;

• stimulation of circular business models through tax and financial initiatives to support the reuse of textiles;

• stimulation of innovations for safe and sustainable chemicals, etc.

Keywords: ecological fashion, recycling, sustainable fashion

https://doi.org/10.53230/tgm.1310-912X.2022.0010.30

CLASSIFICATION OF THE CONCEPTS AND PRINCIPLES OF SUSTAINABLE DEVELOPMENT OF THE FASHION INDUSTRY

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Sustainable fashion is more than creating textiles and products from them, it is a comprehensive cycle of idea, planning, creation, consumption and the inevitable disposal of worn clothes.

The set of questions: "Who, what, how, when and where can predict the expected useful life of a garment?" is becoming increasingly important in the design of textile products.

Sustainable fashion aspirations reflect the fight against the large footprint of fast fashion and modern technology on the environment and influence conceptual clothing collections.

In the process of designing collections or single garments, new rules and principles that affect the selection of materials, production processes and the industrial social environment are perceptibly involved.

The three factors presented in this way: materials, technology and society have a detailed description of the 17 goals of sustainable development.

Sustainable fashion is a symbiosis of products, processes, activities and actors united in achieving a carbon neutral fashion industry built on equality, social justice and ecological integrity.

By definition, fashion is inevitably associated with time - a moment of exclusive demonstration for the purpose of sale and profit. This affects the perception of whether it should be "fast" or "slow", or whether it should be more unique or more comprehensive.

The subject of the article is the correspondence between the standardized description and the public application of the main concepts in sustainable fashion.

The aim is to establish the exact content and meaning of the standardized concepts and definitions of sustainable fashion development and how they are applied in ready-to-wear development. It also aims to establish how far the common usage of these concepts corresponds to their standard content.

Tasks include: literature research, social research through a survey among specialists in this field and processing of the results

Keywords: fashion, clothing design, sustainable principles.

Topic № 7
INNOVATIONS IN TEXTILE EDUCATION

378
Higher Education /
Higher Education Institutions.

https://doi.org/10.53230/tgm.1310-912X.2022.0010.31

BEVILAQUA - DESIGN AND DECORATION OF FABRICS, CREATIVE PROCESS, TYPES OF STYLIZATION, TECHNIQUES FOR MAKING DECORATIVE TEXTILES

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Following the development of humanity and in particular the history of costume - a topic of particular importance to us fashionistas, we understand many of the historical secrets related to art, aesthetic tastes, ideals of beauty, cultural growth in general.

Textile artifacts carry a wealth of information about the development of decorative arts around the world. And, summarizing, we are talking about what humanity has at its disposal, such as centuries-old schools of textile production and decoration, upgraded and existing to this day in various forms.

Of course, artistic achievements and styles are different and it would be good to divide them for convenience into: European, Asian-Oriental, African and North-South American schools.

Each one of them carries the distinctive decorative wealth of peoples from different historical times.

Arts and crafts are the legacy that old techniques preserve for us modern designers. It is no coincidence that many of the big names in fashion are turning their attention to traditional achievements in the field of textile design and decoration, both in fabrics, knitting and leather.

Each of the listed schools is an exciting journey through time, but in order to specify the framework of the lecture, we will lift the curtain revealing a small but very significant part of the European applied school, whose richness of colors, artistic-applied techniques, drawing and variety has no equal - BEVILAQUA – the weaving mill for the production of the iconic Venetian velvets, still alive today. The oldest continent with its oldest textile production workshops.

Thinking of what to start the report with, my mind turned to all that I learned during the Color Group project I had the pleasure of being a part of - The Colors of Venice.

The Radiant Mistress of the Seas!

This is the name by which she was known throughout the world. Its geographical feature determines the wide commercial activity, which is the main advantage in the development and, as the cradle of European civilization.

The political and economic structure of the Municipality of VENETO, turns the region into the richest node on the continent, rich not only in a material sense, but in a cultural-aesthetic sense. Here is the birthplace of the first insurance company and the first law governing patent protection. It is important to mention that here the Church did not exercise its strict control.

https://doi.org/10.53230/tgm.1310-912X.2022.0010.32

APPLICATION OF THE DIGITAL TEXTILE DESIGN COLLECTION THEMED "A LOOK INTO THE DEEP" TO THE STUDENTS OF THE SPECIALTY "ARTISTIC TEXTILE" IN THE SUBJECT "TECHNOLOGY"

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We are living in a time of super-fast information growth. The digital world is increasingly attractive to young people, including the students of the National High School of Art "Dimitar Dobrovich" - Sliven, who are looking for new forms of expression through it. The high school has existed in Sliven since 1981. There are three specialities there: "Artistic textile", "Advertising graphics" and "Icon-painting". The students, overloaded with information, quickly lose interest in the study material. It is for this reason that educators are the ones who have to find new ways and forms of teaching to arouse their interest.

In this regard, in parallel with the realization of my diploma project for my Master's degree at the National Academy of Arts - Sofia /Speciality "Textile - Art and Design"/, I had the opportunity to teach as a guest lecturer to ninth grade students at the National Art School in Sliven. I observed their behavior in the subject "Technology", part of the speciality "Artistic textile".

In the speciality "Artistic textile" students are taught to design and execute in material: wall carpets and textile sculptures, projects for printed textile, painted textile and fashion sketches. The ninth grade technology curriculum includes classes on open composition, designing projects for sea – themed seamless patterns, different methods of designing surface pattern prints and ways to print on different textiles.

Looking for a way to spark the students' interest and motivate them to think creatively, I applied real examples of my designs during the theoretical training, showing them how they look in a digital form and transferred into material.

My collection of seamless pattern designs called " A look into the Deep" was developed entirely digitally, then executed in material by sublimation printing on gabardine. It consists of 60 patterns, divided into 3 series. They are suitable for making beachwear. The ocean is home to over 230,000 known animal species. I designed and styled the images of some of my favourite inhabitants - red coral, Nautilus snail, Tridacna clam, pearl shell, Phyllorhiza punctata (spotted jellyfish), Sea anemone and Zoanthids. The colour palette is inspired by the Pantone NYFW palette for Spring/Summer 2022. Of course, stylization based on various plant and animal forms from the sea is a traditional practice in the National Art School, but I emphasized their practical application.

I have found that using contemporary examples that follow the global trends of the moment; presenting the process of incorporating digital art from textile design awaken and hold students' interest in the given topic of the learning process. The perceived examples serve successfully as an inspiration for further exploration in this field. Thus the students show initiative and willingness to learn new skills.

Key words: textile design, surface pattern design, digital art, teaching, high-school

https://doi.org/10.53230/tgm.1310-912X.2022.0010.33

GRAPHICAL REPRESENTATION OF INTERACTION: WEAVER AND THREADS IN HANDLOOM WEAVING

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Hand weaving has been around for centuries, and many of the techniques used to produce handwoven textiles in the past are still used today.

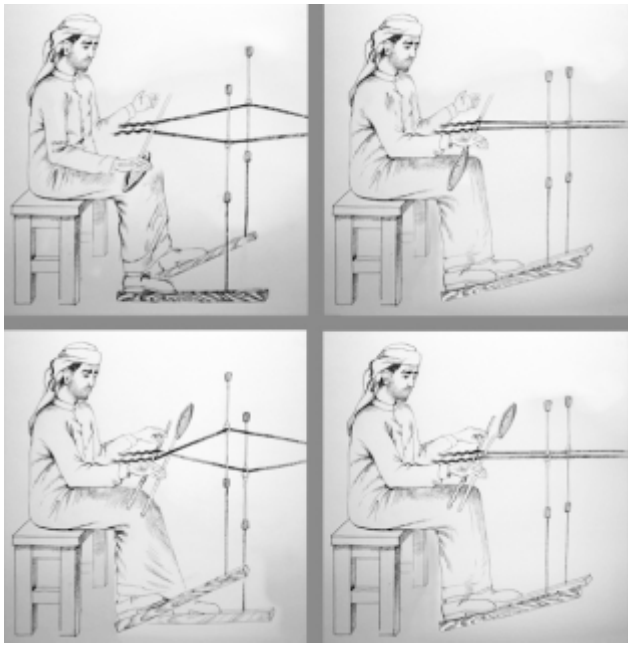
Weaving is a method of textile fabric production in which two systems of threads are crossed in a certain order at right angles to form a fabric. The threads running along the length of the fabric are called warp, and the threads lying across the warp are called weft (Weft is Old English, meaning "that which is woven"). It is customary to depict the warp threads in black and the weft threads in white. The fabric is woven on a loom, a device that keeps the warp threads equally stretched with the same length, density and parallel to each other.

The weaving process can be described as a repetition of three types of actions:

• the warp threads are separated by raising or lowering depending on the weft to form an opening (weaving shed) through which the shuttle can pass;

• the weft thread is unwound from the spool during the flight of the shuttle in the shed;

• the weft passed through the loom is pushed through the reed towards the end of the fabric.



The principal organs of the weaving loom, controlling the warp and weft threads are the heddles, reed and the shuttle.

The weaver of the hand loom uses his feet to drive the pedals, which raise or remove the threads and the shed of the warp threads is formed, and with his hands he moves the shuttle, transferring it from left to right in the shed and after changing the threads back - from right to left. After each passage of the weft thread among the warp threads, the weaver drives the weft thread to the woven fabric by grasping the weft with his hand and pulling it towards him.

The colours of the warp and weft threads affect the pattern, and with careful planning, beautiful patterned effects such as stripes, checks, meanders, etc. are produced.

In the world there are many traditions of hand weaving and different variants of weaving looms, but in the great variety we distinguish two types: vertical and horizontal loom.

Hand weaving is the art of making fabrics by hand that gives aesthetic satisfaction. It helps to get a better idea of the structural relationship between the braid and the colour effect. Stimulates the creation of original patterns, which develops the imagination, the hand and eye acquire accuracy. Training gives to the weaver patience, perseverance, industry, economy of materials, calculation, concentration, dexterity, and self-confidence, which cannot be overestimated. A lot of patience, heart, soul and the aesthetic taste of the master weaver are woven into the handwoven products.

Keywords: hand weaving, weaver - loom interaction, visualisation.

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

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17-19 ноември 2022 година

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на 24-та Националната текстилна конференция, Благоевград
от 17 до 19 Ноември 2022 година

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