ТЕКСТИЛ И ОБЛЕКЛО

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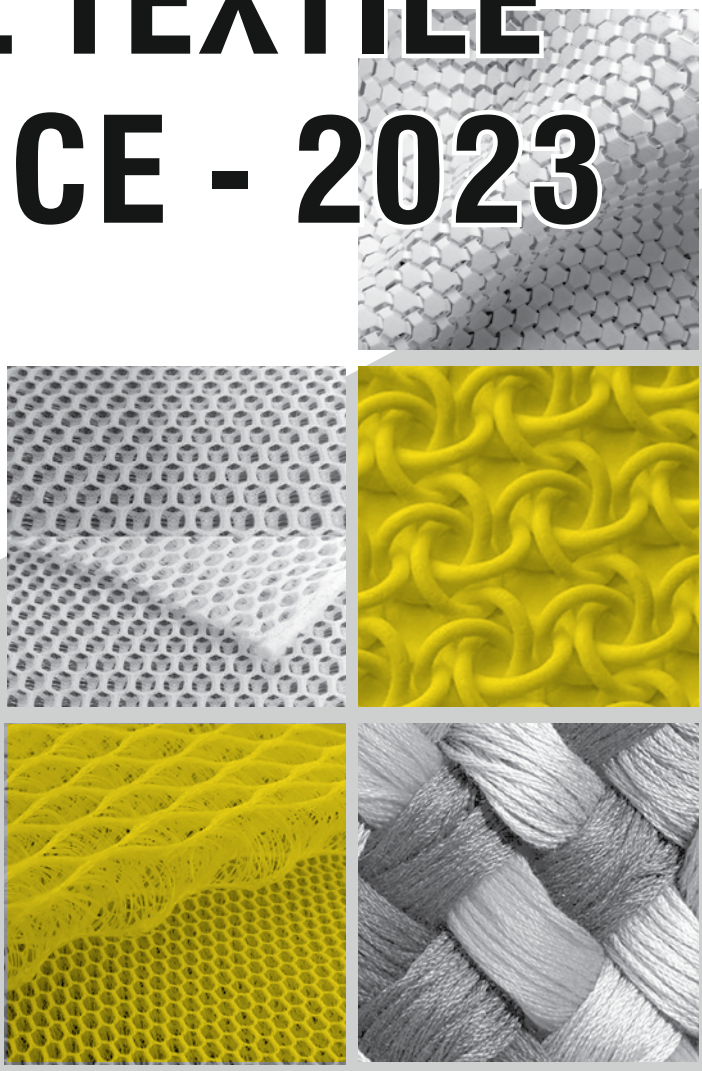
BOOK OF ABSTRACTS

NATIONAL TEXTILE CONFERENCE - 2023



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НАУЧНО-ТЕХНИЧЕСКИ СЪЮЗ
ПО ТЕКСТИЛ, ОБЛЕКЛО И КОЖИ

ОРГАНИЗИРА

XXV НАЦИОНАЛНА ТЕКСТИЛНА КОНФЕРЕНЦИЯ 2023 "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

ЮГОЗАПАДЕН УНИВЕРСИТЕТ "НЕОФИТ РИЛСКИ"

ФОНД НАУЧНИ ИЗСЛЕДВАНИЯ

26-28 октомври 2023 г., Благоевград

Тематични направления:

- нови влакнести суровини, химична обработка и изделия (нанотехники в текстила);
- технология на текстилните материали: предачество, тъкачество и трикотаж;
- технология на шевното производство;
- текстилно изкуство, мода, композиция и представяне на текстилни изделия;
- машинна поддръжка на текстилна техника;
- управление и маркетинг в съвременното текстилно производство;
- съвременна дидактика и методика на текстилното обучение.

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SPECIAL ISSUE 10/2023

BOOK OF ABSTRACTS

NATIONAL TEXTILE CONFERENCE - 2023

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XXV National Textile Conference "Traditions and Innovations in Textiles and Clothing"

In the period October 26-28, 2023, the XXV National Textile Conference with international participation "Traditions and Innovations in Textiles and Garment" was held at the "Bachinovo" University Center of the Neofit Rilski Southwestern University of Blagoevgrad (SWU). The forum is organized annually by the Scientific Engineering Union of Textiles, Garment and Leathers (SEUTGL) with the cooperation of the Universities Departments of Textiles and Design in Bulgaria.

The host of the event this year was the Department of Mechanical Engineering, leading training in the specialty "Design and Technologies for Clothing and Textiles" at the Technical Faculty of SWU.

More than 100 students, doctoral students, specialists, lecturers and scientists from higher schools at home and abroad, from vocational high schools of design, textiles and clothing, from the Institute of Polymers of the BAS, the Institute of defense "Prof. Tsvetan Lazarov", from universities of LPMT-Mulhouse in France, Industrial University of Ho Chi Minh City in Vietnam, TU-Istanbul in Turkey, ENIM of Monastir in Tunisia and Picanol n.v., of Ypres in Belgium. Students, PhD students and scientists from University of St. St. Cyril and Methodius" in Skopje, the Technical University of Dresden, the School of Artistic Weaving in the city of Penne d'Agenais, France and others.

The conference was opened by the Dean of the Technical Faculty Prof. Dr. Eng. Snezhina Andonova. In her welcoming speech, she emphasized that it is an honour and a pleasure for the entire teaching collegium of the faculty to work in a team with the SEUTGL for another year.

The scientific event is also held with the support of the National "Scientific Research" Fund as a result of a winning project under the leadership of the chairman of the SUTGL Assoc. Prof. Ivelin Rahnev, PhD. He emphasized the importance of this traditional scientific forum for all specialists in the field of design, textiles and garment in our country and thanked the sponsors of the conference "E. Miroglio EAD - Sliven, Pirintex EOOD - Gotse Delchev, Lemprier Wool EOOD - Sliven, Picanol n.v. - Belgium, as well as the hosts of the event.

The work of the conference began with a round table on the topic "Human resources of the textile profession". The main thematic speeches were made by Eng. Fani Todorova - chief expert in the "Professional Education and Training" Directorate at the Ministry of Education and Science and Krasimir Valchev - deputy chairman of the Federation of Independent Trade Union Organizations of Light Industry.

In the scientific sessions, papers related to new fibrous raw materials (nanotechnologies in textiles) were presented; antimicrobial textiles and other innovative technologies in textile and sewing production; contemporary textile art, fashion, composition; management, marketing and sustainable development in modern sewing and textile production, as well as current methods and forms of training in the field of textiles and clothing.

Smooth transition between human ressources problems and scientific sessions of the conference was the fashion show, organized by the specialty "Fashion" and leaded by Prof. Dr. Emil Kukov - head of the Department of Fine Art at the Neofit Rilski Southwestern University. The student collections "Eco" and "Tsunami" were realized by the support of the Fine Art department lecturers Dr. Tatiana Hristova, Dr. Milka Alexandrova, Dr. Rositsa Rangelova, and senior lecturer Maria Onteva.

Diversified collection of the students from "Fashion Design" Department at the National Academy of Arts - Sofia, leaded by Prof. Maya Bogdanova, PhD, rised fashion show academic level.

The review also featured the collections "Little Black Dress" and "Elegance in Everyday Life" of students from the specialty "Design and Technologies for Clothing and Textiles" at the Department of Mechanical Engineering of SWU, realized under the guidance of Assistant Professor Umme Kapanak.

Vocational High School of Clothing "Princess Maria Louisa" - Sofia under the guidance of eng. Maria R. Koleva, and Innovative Secondary School "Metodi Draginov" - Draginovo, Velingrad under the supervision of eng. Elka Djurakova " show various collections the modern life or folk traditions based over skills and knowledge of the students.

Among the guests at the opening ceremony of the conference were Maria Dimova - regional governor of the district with administrative center Blagoevgrad, Maria Petrova - deputy mayor of the municipality of Blagoevgrad, teachers, specialists, scientists, students and doctoral students from academic institutions and vocational high schools, where training in textiles, apparel and design is conducted.

INFORMATION FOR AUTHORS

RULES FOR DEPOSITING AND PUBLISHING ARTICLES

Submission of a manuscript should be addressed to the Editorial Office via e-mail (textilejournal.editor@fnts.bg), the paper should be written in Bulgarian from Bulgarian authors and in English (working language) for foreigners.

Copyright Transfer Agreement must be signed and returned to our Editorial Office by mail, fax or e-mail as soon as possible, after the preliminary acceptance of the manuscript. By signing this Agreement, the authors warrant that the entire work is original and unpublished, it is submitted only to this journal and all the text, data, Figures and Tables included in this work are original and unpublished and have not been previously published or submitted elsewhere in any from. Please note that the reviewing process begins as soon as we receive this document. In the case when the paper has already been presented at a conference, it can be published in our magazine only if it has not been published in generally available conference materials; in such case, it is necessary to give an appropriate statement placed in Editorial notes at the end of the article.

General style and layout

Volume of a manuscript submitted should not exceed 12 standard journal pages in single column (3600 characters page), including tables and figures. Format is MS Office Word (normal layout). The editors reserve the right to shorten the article if necessary as well as to alter the title.

Title of a manuscript should not exceed 120 characters.

Full names and surnames of the authors, as well as full **names of the authors' affiliation** – faculty, department, university, institute, company, town and country should be clearly given. Corresponding author should be indicated, and their e-mail address provided.

Abstract of a manuscript should be in English and no longer than one page.

Key-words should be within 4-6 items.

For papers submitted in English (any other working language), the authors are requested to submit a copy with a title, abstract and key words in Bulgarian.

Figures and illustrations with a title and legend should be numbered consecutively (with Arabic numerals) and must be referred in the text. Figures should be integrated in the text with format **JPG at 300 dpi minimum,** and in **editable form.**

Tables with a title and optional legend should be numbered consecutively and must be referred in the text.

Acknowledgements may be included and should be placed after Conclusions and before References.

Footnotes should be avoided.

References (bibliography) should be cited consecutively in order of appearance in the text, using numbers in square brackets, according to the **Vancouver system.**

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South-West University of Blagoevgrad
New Bulgarian University of Sofia
Bulgarian Academy of Science,
Laboratory of Bio Active Polymers

Organising Association:

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

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of Textile, Garment and Leather,
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Co-organiser:
South-West University
"Neofit Rilski" Blagoevgrad

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Phone: +359 2 980 30 45

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Associate Professor Maria SPASOVA, PhD

E-mail: textilejournal.editor@fnts.bg

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

The fee covers:
- Cocktail and Official Dinner;
- Coffee breaks;
- Participations in the conference sessions;
- Publication of the presented papers in «Textile and Garment magazine »
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SCIENTIFIC ENGINEERING UNION OF TEXTILE, GARMENT AND LEATHER, BULGARIA

With the household of

South-West University
"Neofit Rilski" Blagoevgrad,
Department of Mechanical Engineering,
leading training in the specialty
"Design and Technology for Garment and Textiles"

And
National Fund "Research"

in collaboration with the departments of textile and design

organize

XXV NATIONAL TEXTILE CONFERENCE 2023

"Traditions and Innovations in Textile and Garment"

October 26-28 2023

University Centre "Bachinovo"
Blagoevgrad
Bulgaria

Main Topics:

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

Instructions for authors

Templates are available online at:
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- **Abstract:**
  - In English
  - The abstract should to be prepared according to the abstract template and should be restricted to maximum 1 page
  - The abstracts will be published in «Textile and Garment Magazine» issue 10/2023
- **Presentation:**
  - Maximum 14 slides
  - The presentation should to be prepared with MS Office - Power Point
  - The presentation should to be no longer than 15 min.
- **Poster:**
  - In English or Bulgarian
  - Format A2
- **Paper:**
  - In English or Bulgarian
  - The paper should to be prepared according to the paper template and should be restricted to maximum 12 pages
  - The papers will be published in « Textile and Garment magazine », ISSN 1310-912X (print), ISSN 2603-302X (Online), issues from 11'2023 to 9'2024

DEADLINES

- Abstracts submission - **September 29th 2023**
- Papers submission - **November 30th 2023**
- Registration - **October 26th 2023**

Languages: Bulgarian and English

XXV National Textile Conference 2023

26 - 28 October 2023, Blagoevgrad, Bulgaria

South-West University "Neofit Rilski"
University Centre "Bachinovo"
2700 Blagoevgrad, Bulgaria

Registration Form

Name .....
Surname .....

Institution .....
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e-mail, phone:.....
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The Title of the Paper:
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The Topic of the Paper:
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Oral Presentation
Poster Presentation

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DAILY SCHEDULE

XXV NATIONAL TEXTILE CONFERENCE 2023,
"Traditions and Innovations in Textile and Garment",
October 26-28 2023, University Centre "Bachinovo", Blagoevgrad, Bulgaria

		1. First Day: 26.10.2023	**Hall**
1.1.	12:00	Accommodation in hotel UC Bachinovo	***reception***
1.2.	12:30 – 13:00	Registration in NTC23	conference hall
1.3.	13:00 - 14:30	Workshop „Textile profession Staffing“	conference hall
1.4.	*14:30 – 14:45*	*Coffee-break with poster session*	*central foyer*
1.5.	14:45 – 16:00	Visit to the models review of NY Competition 2023	***central foyer***
1.6.	*16:00– 16:15*	*Coffee-break with poster session*	*central foyer*
1.7.	16:15 – 17:15	2 presentations x 30 minutes, 2 plenary lectures	conference hall
1.8.	*17:15– 17:30*	*Coffee-break with poster session*	*central foyer*
1.9.	17:30 – 18:30	2 presentations x 30 minutes, 2 plenary lectures	conference hall
1.10.	*18:30– 18:45*	*Coffee-break with poster session*	*central foyer*
1.11.	18:45 – 19:15	1 presentation1 x 30 minutes, 1 plenary lecture	conference hall
1.12	***19:15 – 21:00***	***Welcome cocktail of the NTC23***	***restaurant***
		2. Second Day: 27.10.2023	
2.1.	*08:00 – 08:15*	*Registration in NTC23*	conference hall
2.2.	08:15 – 09:45	6 presentations x 15 minutes, 5 reports	conference hall
2.3.	*09:45 – 10:00*	*Coffee-break with poster session*	conference hall
2.4.	10:00 – 11:00	4 presentations x 15 minutes, 4 reports	conference hall
2.5.	*11:00 – 11:15*	*Coffee-break with poster session*	conference hall
2.6.	11:15 – 12:15	3 presentations x 15 minutes, 3 reports	conference hall
2.7.	***12:15 – 13:00***	***Working lunch***	***restaurant***
2.8.	13:00 – 14:00	4 presentations x 15 minutes, 4 reports	conference hall
2.9.	*14:00 – 14:15*	*Coffee-break with youth's exposition*	conference hall
2.10.	14:15 – 15:15	4 presentations x 15 minutes, 4 reports	conference hall
2.11.	*15:15 – 15:30*	*Coffee-break with youth's exposition*	conference hall
2.12.	15:30 – 16:30	4 presentations x 15 minutes, 4 reports	conference hall
2.13.	*16:30 – 16:45*	*Coffee-break with youth's exposition*	conference hall
2.14.	16:45 – 17:45	4 presentations x 15 minutes, 4 reports	conference hall
2.15.	17:45 – 19:15	Visit to the youth's exposition	conference hall
2.16	***19:30 – 22:00***	***Gala dinner***	***restaurant***
		3. Third Day: 28.10.2023	
3.1.	08:00 – 08:15	*Registration in NTC23*	conference hall
3.2.	08:15 – 09:30	5 presentations x 15 minutes, 4 reports	conference hall
3.3.	*09:30 – 09:45*	*Coffee-break with youth's exposition*	conference hall
3.4.	09:45 – 10:45	4 presentations x 15 minutes, 4 reports	conference hall
3.5.	*10:45 – 11:00*	*Coffee-break with youth's exposition*	conference hall
3.6.	11:00 – 12:00	4 presentations x 15 minutes, 3 reports	conference hall
3.7.	***12:00 – 12:30***	***Working lunch***	***restaurant***
3.8.	12:30 – 13:15	Poster session and youth's exposition	conference hall
3.8.	12:30 – 13:15	Award ceremony of the youth competition – 2023	***central foyer***
3.9.	***14:00 – 14:15***	***Closing the conference***	***central foyer***

SCIENTIFIC COMMITTEE

of the 25th National Textile Conference with international participation, Blagoevgrad, Bulgaria
October 26th to 28th 2023

INVITED LECTURERS

1. Prof. Ilia RASHKOV, DSc, Corresponding member of BAS, IP BAS – Sofia
2. Prof. Ivan GEORGIEV, PhD, Technical University – Sofia
3. Prof. Andreas CHARALAMBUS, PhD, TU – Sofia
4. Prof. Ivo GRABCHEV, DSc, University of Sofia
5. Prof. Hristo PETROV, PhD, Technical University – Sofia
6. Prof. Penka Dimitrova, PhD, Technical University – Sofia
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8. Prof. Adelina POPNEDELEVA, National Academy of Arts – Sofia
9. Prof. Maya BOGDANOVA, National Academy of Arts (NAA) – Sofia
10. Prof. Nevena MANOLOVA, DSc, IP BAS – Sofia
11. Assoc. Prof. Rumen RUSSEV, PhD, Trakia University – Stara Zagora

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18. Dr Gaetano RIMINI, "E. Miroglio" EAD - Sliven

RESPONSIBLE REVIEWERS FOR THE SCIENTIFIC PROGRAM

19. Prof. Snezhina ANDONOVA, PhD, South-West University – Blagoevgrad, Chair of the Conference
20. Prof. Radostina ANGELOVA, DSc, TU – Sofia
21. Prof. Emil KUKOV, PhD, South-West University – Blagoevgrad
22. Prof. Zlatina KAZLACHEVA, PhD, Trakia University - Stara Zagora
23. Assoc. Prof. Desislava Staneva GRABCHEVA, PhD, UCTM – Sofia
24. Assoc. Prof. Maria SPASOVA, PhD, IP - BSA – Sofia
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of the 25th National Textile Conference with international participation, Blagoevgrad, Bulgaria

October 26th to 28th 2023

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3. Assoc. Prof. Ivelin RAHNEV, PhD, E. Miroglio EAD – Sliven
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8. Eng. Krasa KOSTOVA, PhD, BDI Professor Tsvetan Lazarov – Sofia
9. Eng. Maria KOLEVA , HVSG Maria Louisa – Sofia
10. Eng. Marin MARINOV, Iskra OOD – Parvomay
11. Valentina DIMITROVA, HVSGLP – Sofia
12. Alexander DOYTCHINOV, NAHS "Dimitar Dobrovich" – Sliven
13. Eng. Tashka KOLEVA, HVSTG D. Zhelyazkov – Sliven
14. Eng. Umme KAPANYK, Stil OOD – Gotse Delchev
15. Petroslav GERENSKI, CEO, Nuance BG Ltd. – Sofia

PRESENTERS LIST

25th National Textile Conference 2023 in the
Bachinovo University Center at SWU Neofit Rilski – Blagoevgard, 26-28.10.2023

№	Presenter	Report Tituli / Acronym	date	hour	Session chair
1	**A. Sezai Sarac**	POLYMERIC COMPOSITE ELECTROSPUN NANOFIBERS WITH NANO FILLERS	26.10.2023	16:45	prof. Saber Ben Abdessalem
2	**Dritan Manaj**	Turnitin authencity		17:30	
3	**Saber Ben Abdessalem**	STUDY OF PHYSICO-CHEMICAL AND MECHANICAL PROPERTIES OF WILLIAM CAVENDISH BANANA PEDUNCLE FIBERS		18:00	prof. A. S. Sarac
4	**Adriano Oggioni**	PICANOL NV DEVELOPMENT		18:30	
5	**VU Thi Hong Khanh**	STUDY ON THE APPLICATION OF DBD PLASMA IN FLAME RETARDANT TREATMENT FOR DYED COTTON FABRICS		8:15	prof. Snezhina Andonova
6	**Sylvie Boyer**	TISSAGE d'ART		8:30	
7	**Tashka Ivanova Koleva**	COMPOSITION OF WORKING PROCEDURES AND INSTRUCTIONS FOR THE QUALITY OF RAW FABRICS		8:45	
8	**Desislava Grabcheva**	PHOTODYNAMIC ANTIBACTERIAL ACTIVITY OF COTTON FABRIC MODIFIED WITH 1,8-NAPHTALIMIDE DERIVATIEVES		9:15	
9	**Ivo Grabchev**	THE INTERPLAY BETWEEN LIGHT AND TEXTILE MATERIALS FOR HUMAN WELL-BEING AND AESTHETIC PERCEPTION OF THE WORLD		9:30	
10	**Ina Anastasova**	INNOVATIVE ANTIBACTERIAL AND ANTICANCER ELECTROSPUN NON-WOVEN TEXTILE FROM CHITOSAN SCHIFF BASE AND POLYLACTIDE AND ITS COMPLEXES WITH Cu2+ AND Fe3+		10:00	prof. Ivo Grabchev
11	**Nasko Nachev**	ELECTROSPUN POLYMER MATERIALS WITH ANTIFUNGAL POTENTIAL		10:15	
12	**Daniela A. Atanasova**	TEXTILE-HYDROGEL COMPOSITE MATERIAL-ANTI-INFLAMMATORY AGENT, WITH POTENTIAL APPLICATION AS A WOUND DRESSING		10:30	
13	**Boyan Koev**	EFFECTIVE ORGANIZATION OF HANDWEAVING FOR MASS PRODUCTION		10:45	

14	**Elitsa Kadreva**	CONSTRUCTION OF A DATABASE FOR THE STORAGE AND REPRODUCTION OF HOUSEHOLD WOVEN FABRICS	27.10.2023	11:15	Associate prof. Kapka Manasieva
15	**Petya Tsekova**	ELECTROSPUN CELLULOSE ACETATE/NANOCLAYS COMPOSITES FOR POLLUTANT REMOVAL		11:30	
16	**Elka Djurakova**	AUTHENTICITY AND STYLIZATION OF THE FESTIVE WOMEN'S COSTUME FROM THE CHEPIN REGION - THE VILLAGE OF DRAGINOVO		11:45	
17	**Ivelin Rahnev**	POTENTIAL ENERGY EQUILIBRIUM OF THE ELASTIC DEFORMATION IN THE TWISTED FIBROUS SHEAF		13:00	Associate prof. Desislava Grabcheva
18	**Rositsa Ruskova**	APPLICATION OF MODERN CARPENTRY TECHNOLOGIES FOR MAKING A HORIZONTAL HAND-OPERATED LOOM		13:15	
19	**Hamid Hamid BenVedi**	SOCIAL POLICIES IN PRODUCT STANDARDS FOR TEXTILE AND SEWING PRODUCTION		13:30	
20	**Krasa Kostova**	MILITARY CLOTHING IN THE BULGARIAN ARMY – PAST, PRESENT AND FUTURE		13:45	
21	**Irina Vasileva**	WEAVING KNOTS AND THEIR IMPACT ON THE ARTISTIC TEXTILE CREATED ON A VERTICAL		14:15	Prof. Emil Kukov
22	**Tanya Randeva Nedelcheva**	APPLICATION OF THE CHAIN OF CUSTODY IN THE TRANSFER OF WOOLEN RAW MATERIALS IN B2B TRANSACTIONS		14:30	
23	**Petya Gencheva-Nedyalkova**	REQUIREMENTS FOR THE FABRICS AND MATERIALS SUITABLE FOR THE CONSTRUCTION OF MILITARY UNIFORMS		14:45	
24	**Maria Spasova**	ELECTROSPUN BIOPOLYMER MATERIALS LOADED WITH PHENOLIC COMPOUND WITH HIGH ANTIOXYDANT ACTIVITY		15:00	
25	**Hristo Hadjiev**	DEVELOPMENT OF ELECTRICALLY CONDUCTIVE GLASS FIBRE YARN BY ION BEAM COATING TECHNOLOGY FOR THE USE IN integrated SENSORS		15:30	Associate prof. Maria Spasova
26	**Maria Rangelova Koleva**	REGULATIONS IMPACT ON SUSTAINABLE DEVELOPMENT OF CLOTHING		15:45	
27	**Maria-Anna Grigorova**	MODEL DEVELOPMENT OF BULGARIAN NATIONAL COSTUME FOR WEDDING		16:00	

28	**Victoria Stoyanova**	LADIES SPORTS DRESS		16:15	
30	**Daniela Angelova**	APPLICATION OF INNOVATIVE TEXTILE COMPOSITES FOR SORPTION OF PETROLEUM AND PETROLEUM PRODUCTS		16:30	Dr. Nezabravka Popova - Nedyalkova
31	**Vesislava Toteva**	PROCESSING OF WASTE COTTON TO GLUCOSE AND VALUABLE CHEMICALS (HYDROXYMETHYLFURFURAL)		17:00	
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34	**Goran Demboski**	SEAM PERFORMANCE OF MOTORBIKE SUIT	28.10.2023	8:45	Associate prof. Petia Gencheva-Nedyalkova
35	**Stamen Antonov**	STUDY OF THE DESIGN OF COMPONENTS FOR PERSONAL BALLISTIC PROTECTION (PBP) SYSTEMS USING CAD/CAM/CAE SYSTEMS		9:00	
36	**Ivaylo Hristov Vladimirov**	EDUCATION FOR THE FUTURE		9:15	
37	**Mirena Nencheva Chakarova**	GEOMETRY OF THE SHIRT, LIGHT AND SHADOW		9:45	prof. Maya Bogdanova
38	**Vera Dimitrova**	POV – THE WAY ALIENS SEE US		10:00	
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Industry of High Molecular Substances. Rubber industry. Plastic industry.

Youth review: Eco collection from the Fashion department of SWU Neofit Rilski

Youth review: Eco collection from the Fashion department of SWU Neofit Rilski

https://doi.org/10.53230/tgm.1310-912X.2023.0010.01

INNOVATIVE ANTIBACTERIAL AND ANTICANCER ELECTROSPUN NON-WOVEN TEXTILE FROM CHITOSAN SCHIFF BASE AND POLYLACTIDE AND ITS COMPLEXES WITH Cu^{2+} AND Fe^{3+}

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Introduction Chitosan (Ch) is biocompatible, biodegradable and non-toxic natural polymer that possess beneficial biological properties - antibacterial, antioxidant and anticancer. In addition, 8-hydroxyquinoline (8Q) and its derivatives have been reported to exert several favorable activities - antibacterial, antifungal, anticancer, antiviral and antioxidant. The chelating ability of these compounds towards biologically significant transition metal ions (Cu^{2+}, Fe^{2+}, Fe^{3+}, etc.) has an impact on their biological activity. The purpose of this work was to study the possibility of preparing innovative electrospun non-woven textile containing Schiff base derivative (Ch-8Q) of Ch and 8-hydroxyquinoline-2-carboxaldehyde or its complexes with Cu^{2+} or Fe^{3+}, as well as to investigate the influence of the fiber composition on the antibacterial and anticancer activities of the materials.

Experimental part Ch-8Q was synthesized as described earlier [1]. Custom-made electro-spinning set-up was utilized. Cu^{2+} or Fe^{3+} complexes of electrospun mats were obtained by the procedure described in our previous report [1]. The morphology of the electrospun materials was examined by scanning electron microscopy. The antibacterial activity of the obtained materials was evaluated using the viable cell-counting method. The anticancer activity was assessed by the MTT assay.

Results and Discussion Innovative non-woven textile from poly(L-lactide-co-D,L-lactide) (PLA) and Ch-8Q was successfully fabricated by one-pot electrospinning of their blend solution. The Cu^{2+} and Fe^{3+} complexes of the obtained textile were also prepared. The formation of complexes was proven by using scanning electron microscopy, attenuated total reflection Fourier-transform infrared spectroscopy and X-ray photoelectron spectroscopy. The performed microbiological test showed that Ch-8Q/PLA mats and their complexes exhibited good antibacterial efficacy against the pathogenic bacteria S. aureus. Cell viability MTT assay revealed that Ch-8Q-containing materials and their complexes possess good antiproliferative activity and decrease considerably the viability of the HeLa and MCF-7 cancer cells for the different periods of cell incubation. Moreover, the observed cytotoxicity of the electrospun nonwoven textile against cancer cells was greater than that against non-cancer BALB/c 3T3 fibroblasts.

Conclusion Thus, the innovative non-woven textile has potential as dressing material in wound treatment, as well as for application in the local therapy of cervical and breast cancer.

Keywords: chitosan Schiff base, electrospinning, Cu^{2+} and Fe^{3+} complexes, antibacterial activity, anticancer electrospun non-woven textile

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

[1] Ignatova M., Anastasova I., Manolova N., Rashkov I., Markova N., Kukeva R., Stoyanova R., Georgieva A., Toshkova R., Polymers 14, 5002 (2022)

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ELECTROSPUN CELLULOSE ACETATE/NANOCLAYS COMPOSITES FOR POLLUTANT REMOVAL

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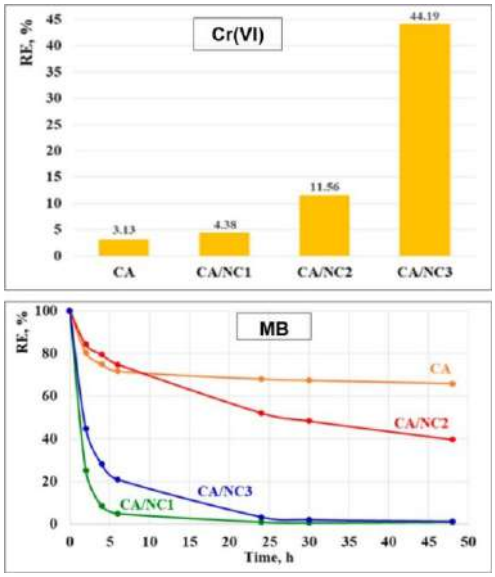
Introduction The creation of eco-friendly clay-based composites for pollutant removal by adsorption still remains a challenge. This problem might be successfully solved by the development of electrospun polymer–clay composites. However, the studies on obtaining cellulose acetate (CA)/clay-based composites by electrospinning for pollutant removal are still scarce. In this regard, in the present study a one-step preparation of CA fibers filled with nanoclays was described.

Experimental part Cellulose acetate (CA, 30000 g/mol and acetyl content 39.8%) and three different nanoclays (NCs) - hydrophilic bentonite NC1 (Nanomer® PGV), NC2 (Nanomer® 1.28E) and NC3 (Nanomer® 1.31PS) were purchased from Sigma-Aldrich. Acetone (≥ 99.5%), methylene blue B (MB) and potassium dichromate ($K_2Cr_2O_7$) were supplied by Merck. All chemicals were of analytical grade and used without further purification.



Results Electrospinning was successfully used for the one-step fabrication of fibrous CA composites filled with NC1, NC2 and NC3 [1]. The addition of nanoclays had no significant effect on the fibers surface morphology. In confirmation of the FT-IR results, TG analyses clearly showed that during the electrospinning process CA and NCs did not react. Based on XRD analysis, it was concluded that the distribution of nanoclay layers in the CA/NCs composites was a mixture of intercalated and exfoliated structures. Considering the potential application for pollutant removal, the adsorption ability of electrospun CA/NC composites in water was evaluated toward Cr(VI) ions and MB as a model pollutant dye, compared with this of electrospun CA.

Conclusion Novel CA/nanoclay composites were fabricated by one-pot electrospinning. The adsorption studies clearly showed that the nanoclay type strongly influenced the adsorption capability of composites toward Cr(VI) ions and MB dye. The results suggest that the obtained novel electrospun composites are potential candidates for pollutant removal from water.

Keywords: electrospinning; cellulose acetate; nanoclays; Cr(VI) adsorption; methylene blue removal.

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.

[1] P. Tsekova, O. Stoilova, Polymers, 14, 5070 (2022).

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THE INTERPLAY BETWEEN LIGHT AND TEXTILE MATERIALS FOR HUMAN WELL-BEING AND AESTHETIC PERCEPTION OF THE WORLD

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Textile materials are all around us. They are an irrevocable part of human life because they have a protective function, but in general, the user's choice depends on their aesthetic attitude. That is why fashion draws inspiration for its works from the colour of fabrics or their sparkling whiteness.

The colour of textile materials depends on their structure, the dyes used, the light, and the colour perception of each person. Therefore, this ubiquitous phenomenon combines various scientific fields such as chemistry, physics, physiology and psychology. The colour is a consequence of the interaction of light and the textile material. Fluorescent dyes absorb and emit light, so the impression is of two combined colours. Optical brighteners also fluoresce but emit light that offsets the blue light absorbed by yellowed-white fabrics.

Consumers expect the beauty of textiles to be preserved as long as possible. Sometimes, however, changing the colour and fluorescence of materials can be favourable and serve to track the changes that occur in the person and their environment. The dyeing textile materials with dyes with sensory properties make them suitable for applications in medicine, healthcare, workwear, fashion or wherever challenging design is needed.

Fabrics dyed with photosensitizers, in addition to their beautiful colour, interact with light and oxygen in the air, releasing singlet oxygen and providing antimicrobial protection.

The light also relates to the photosensitive dyes with which the cotton or polyamide fabric is dyed and causes the formation of radicals that initiate photopolymerization. With this treatment, the surface of the fabrics acquires new properties.

Therefore, the light to which life on Earth is due also plays a principal role in textile materials handling and participates in their innovative applications that are unexpected today, which will have wide application in the future.

Keywords: textile, colour, light, dyes, medicine, fashion.

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ELECTROSPUN POLYMER MATERIALS WITH ANTIFUNGAL POTENTIAL

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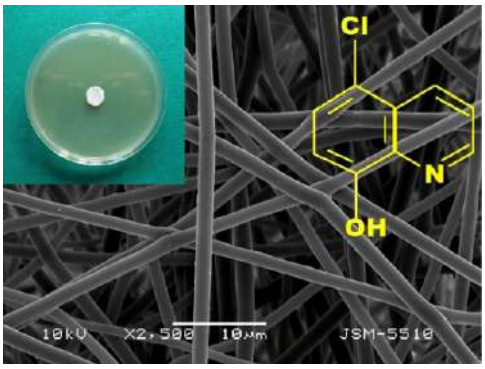
Introduction Cutting-edge nanotechnologies such as electrospinning, electrospraying, coaxial electrospinning, centrifugal electrospinning, etc. have attracted special interest in recent years. These innovative methods allow the production of fibrous materials from both synthetic and natural polymers with high specific surface area, high porosity, and various designs for diverse applications. In addition, the incorporation of compounds with biological activity is easily achievable. Moreover, biocontrol agents, able to suppress the development and growth of plant pathogens, could be embedded in the fibrous materials as well. The application of such nanotechnologies for the fabrication of plant protection products is an extremely promising new direction.

Experimental part Cellulose acetate (CA, M_n = 30 000 g/mol and DS 39.8%), polyethylene glycol (PEG, M_r = 1 900-2 200 g/mol), poly(L-lactic acid) (PLA, M_w = 259 000 g/mol and M_w/M_n = 1.94), poly(3-hydroxybutyrate) (PHB, M_w = 330 000 g/mol), polyvinylpyrrolidone (PVP, M_r = 24 000 g/mol), 5-chloro-8-hydroxyquinoline (5-Cl8Q), potassium 5-nitro-8-quinolinolate (K5N8Q) and 5-chloro-7-iodo-8-hydroxyquinoline (CQ) were used. Acetone of analytical grade of purity, ethanol (abs. EtOH), N,N-Dimethylformamide (DMF), chloroform and dimethyl sulfoxide (DMSO) were also used.

Results and Discussion Fibrous membranes of CA, CA/5-Cl8Q; CA,PEG; CA,PEG/5-Cl8Q, PLLA; PLLA/5-Cl8Q; PLLA/K5N8Q; PHB and PHB/PVP,CQ were obtained by electrospinning/electro-spraying. The morphology of the obtained materials was assessed by SEM and it was found that the fiber diameters decreased with the addition of water-soluble polymer or low molecular weight compounds. The incorporation of the water-soluble polymer resulted in hydrophilization of the materials that was proved by the water contact angle measurements. Biological tests were conducted to evaluate the antifungal potential of the materials against Phaeomoniella chlamydospora and Phaeoacremonium aleophilum. It was found that the mats containing the 8-hydroxyquinoline derivatives possessed strong antifungal activity. The obtained results reveal the potential of the created fibrous materials with antifungal effect as promising candidates for fabrication of plant protection products in agricultural field.



Conclusion Polymer membranes based on biodegradable and biocompatible polymers are fabricated by conducting electrospinning or electrospinning with electrospraying. The incorporation of biologically active substances into the membranes imparted to them a significant antifungal effect. The results suggest that the obtained fibrous materials have great potential for application in agriculture. [Nachev, N., Spasova, M., Manolova, N., Rashkov, I., Naydenov, M., Electrospun Polymer Materials with Fungicidal Activity: A Review, Molecules, 27, 1-19 (2022)]

Keywords: electrospinning; electrospraying; biopolymers; bioactive substances; antifungal 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

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DEVELOPMENT OF ELECTRICALLY CONDUCTIVE GLASS FIBRE YARN BY ION BEAM COATING TECHNOLOGY FOR THE USE IN INTEGRATED SENSORS

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The aim of the joint project was the realisation of innovative component monitoring sensors (Structural Health Monitoring (SHM)), which are directly integrated into the structure of glass fibre reinforced plastic components (GRP). For the integration of sensory functions into the structure of GRP, highly conductive fibre materials are necessary. The common way is here to use electrically conductive non-glass fibre yarns (e.g. copper cables, conductive polyamide yarns, etc.). But when integrating into GRP, these foreign materials, can significantly weaken the GRP in a variety of ways (e.g. as shown by X. Chen, S. Guo, J. Li, G. Zhang, M. Lu und Y. Shi, „Flexible piezoelectric nanofiber composite membranes as high performace acoustic emission sensors," Sensors and Actuators A: Physical 199 (2013), pp. 372-378, 28. Juni 2013).

Standard glass fibre yarn has no electrically conductive properties. Therefore the project involved the development of electrically conductive glass fibre yarns using the ion beam coating technology of Nanoedge GmbH [1,2]. These coated glass fibre yarns are later used as sensor electrodes in the SHM development of the project partner DITF. They should prevent the formation of negative interface reactions and structural delamination effects in GRP, as they usually appear by using foreign non-glass fibre yarns.

To enable the development of the required electrically conductive glass fibre yarns, conventional glass fibre yarns had to be coated with an electrically conductive coating by Nanoedge GmbH. For this purpose, a winding device (roll-to-roll) was developed to handle the glass fibre yarn, which was later operated in a vacuum chamber. The highly conductive material silver 99.9% was chosen as the preferred coating material which was applied by the low temperature ion beam coating process of Nanoedge GmbH.

One of the main influencing factors to the coating process is the so-called glass fibre sizing material. These sizing layers (mainly silane based substances) are of crucial importance for the flexibility of the inherently very brittle glass fibre yarns. This flexibility is absolutely necessary for subsequent machine processing of fabrics and embroideries, which are the base construction material of GRP. The sizing material also prevents a direct contact between the electrically conductive silver layer and the actual surface of the glass fibre yarn. This leads to poor adhesion of the coating. For this reason, a physical plasma process (integrated into the coating process itself) ,to remove and reactivate the sizing, was also developed by Nanoedge GmbH during the project.

The coating parameters were adjusted iteratively in ongoing exchange with the project partner DITF, that tested the different coated glass fibre yarns by processing them to specific fabrics and embroideries. The coating quality (e.g. uniformity) was continuously assessed using light microscopy and energy dispersive x-ray spectroscopy (EDX).

Before the project started, it was clear that for the construction of a redundantly functioning SHM systems, it is also important that the electrode material (coated glass fibre yarn) has an electrical resistance that is evenly distributed over its length. While the iteration process this was tracked by a four-conductor measurement (according to DIN EN 16812).

Finally different glass fibre yarns with a silver-coating up to 300 nanometres of thickness and a resulting electrical resistance value of up to 200 ohms per meter were selected.

These glass fibre yarns were used by the DITF to build a bending and impact sensor. For this purpose, suitable sensory fabric layers were created using various weaving and embroidery processes. The coated glass fibre yarns serve as sensor electrodes and replace the otherwise commonly used foreign materials (various electrically conductive yarns) in the already known piezoelectric sensor structure of DITF [3,4].

With the fabrication of a SHM demonstrator (GRP-rotor blade of a small wind turbine), it was proved that the electrically conductive glass fibre yarns are fundamentally suitable for the use as electrode material in structure-integrated sensors. After connecting of corresponding power electronics, redundant and evaluable signals can be determined during an impact and bending load on the rotor blade.

Keywords: electrically conductive glass fibre; structural health monitoring; ion beam coating; glass fibre reinforced plastic; piezoelectric sensor

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COMPARATIVE STUDY OF TWO TYPES OF METAL PARTICLES ON THE PROPERTIES OF TEXTILE MATERIALS

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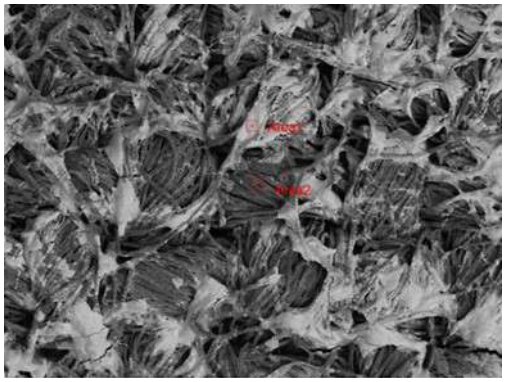
It has been proved that inorganic nanoparticles (NPs) can inactivate the virus due to rupture of the viral envelope by generation of oxidative species. The properties of metal nanoparticles and metal oxides such as titanium dioxide (TiO_2), zinc oxide (ZnO), silver (Ag) and copper (Cu) are well known as effective antimicrobial agents. Among other inorganic NPs, TiO_2 nanoparticles (TiO_2-NPs) and ZnO-NPs have attracted the attention of researchers because they are biocompatible, nontoxic, and relatively inexpensive.

A comparative analysis of the properties of cotton fabric modified with gelatin hydrogel cross-linked with glutaraldehyde and containing ZnO and TiO_2 nanoparticles, respectively, was made in this study. Three methods of ZnO and TiO_2 synthesis were investigated by varying the components and processing conditions. The *in situ* method for obtaining ZnO and TiO_2 nanoparticles separately on the surface of cotton fabric was successfully applied. The composite materials were examined by means of SEM, UVA/VIS/NIR spectrophotometric and antibacterial activity analysis.

Non-identical distribution distribution behavior of the different metal particles was observed in the microscopic studies. TiO_2-NPs were impregnated into the hydrogel structure on the cotton fabric and were distributed into small film-forming structures in the cotton fabric and unevenly agglomerated. In the composites with included ZnO nanoparticles, obtained by one of the methods, showed that the spherical particles changed into a flower-like shape, with needle-like ends, indicating that the nucleation of ZnO crystal structures started on the textile surface.



In the UV-spectral analysis, the appearance of new peaks at 877 cm^{-1} to 890 cm^{-1} was observed, confirming the association of the formed TiO_2 nanoparticles with the hydroxyl groups in the composites. For the other metal particles, a new absorption peak at 651 cm^{-1} appears due to the attachment of ZnO-NPs. The appearance of new peaks at 720 cm^{-1} to 870 cm^{-1} confirms the formation of tetrahedral coordination of ZnO.

Antibacterial studies show different activity depending on the strain and type of composites. The TiO_2-NPs modified samples showed better activity against the Gram-positive and Gram-negative bacteria used compared to the ZnO-NPs modified samples. Biocomposites cotton-gelatin-ZnO NPs or respectively with TiO_2nanoparticles can be very effective used in the form of wound dressings.

Keywords: *modification, cotton fabric, gelatin, metal nanoparticles*

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POLYMERIC COMPOSITE ELECTROSPUN NANOFIBERS WITH NANO FILLERS

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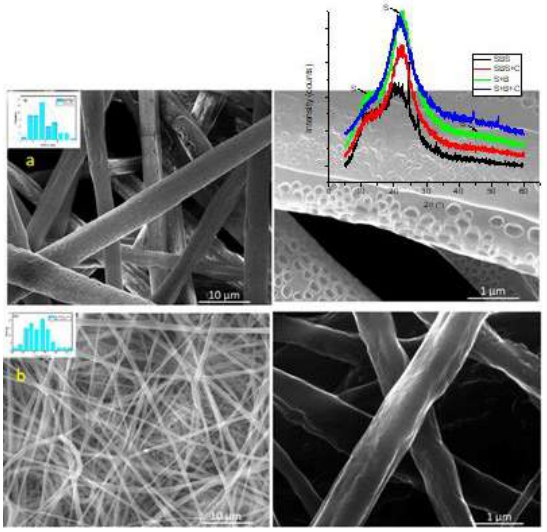
Introduction Electrospinning is one of the processing methods for deriving micro- and nanofibers from polymer solutions and melts by the presence of electrical forces. Electrospun fibrous polymeric composite membranes with a high surface area and high pore density serve in medical and tissue engineering, batteries, catalytic applications, and smart textile products. Carbon nanotube(CNT)/ polymeric composite smart fibers can contribute to health and medical applications i.e., bone reconstruction, where sensing and soft surface are required, the development of fiber and textile structures with enhanced breathability as a delivery tool for drugs and biomolecules to enhance cell recovery.

In this study, CNT- and Fe-based nanofillers were applied to optimize the properties of the polymer matrices in the fiber form and investigate the effects of the nanofillers. The electrospinning was used successfully to fabricate nanofibers of Iron oxide/poly(m-anthranilic acid)/poly(ε-caprolactone) and CNT/polybutadiene (PBu), and poly(styrene–butadiene–styrene) (SBS) composite elastomeric fibers, and they are thermomechanically, and spectroscopically characterized.

Experimental part Dynamic mechanical analyses, X-ray photoelectron spectroscopy, Scanning electron microscopy(HRSEM), Fourier-transform infrared spectroscopy, Raman spectroscopy, and X-ray diffractometry are employed to investigate the mechanism of interaction between nanofiller and polymer matrix. CNT-embedded SBS (Mw ~ 140 k), and PBu (Tg = 95 °C, Mw ~ 200 k)-Polyethylene oxide (PEO, Tg =-67°C, Mw of ~100 k), poly(ε-caprolactone) (PCL, Mw: 80 k) matrices are used.



Results & Discussion The Inclusion of CNTs into SBS decreases the fiber thickness by an order of magnitude, from micro to nanoscale, while a transition from a porous to nonporous and rough morphology is attained (Fig.). HRSEM and energy-dispersive X-ray supported the findings of the thermomechanical analysis, and the mechanism of interaction between CNTs and the SBS tri-block copolymer matrix through the determination of the morphology, pi–pi* interactions, and the crystallinity of the composite fibers. The mechanical properties of CNTs-filled electrospun fibers are improved compared to the original fibers. The semicrystallinity of SBS/PStyr disappears with the inclusion of CNTs of 1.25 wt%, indicating even small quantities of CNTs retard the crystallization process. The inclusion of iron and carboxylic acid-functionalized polyaniline into PCL enhances the electron-donating ability which in turn increases the compound conductivity and may induce reversible redox chemistry, allowing them to be used in electrochemical immunosensors and drug delivery.

Keywords: Electrospun nanofibers,carbon nanotube, poly(styrene–butadiene–styrene), poly(ε-caprolactone)

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PHOTODYNAMIC ANTIBACTERIAL ACTIVITY OF COTTON FABRIC MODIFIED WITH 1,8-NAPHTALIMIDE DERIVATIEVES

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Introduction
Textile materials modification with substances with photodynamic antimicrobial activity is promising current tendency to deal with enhanced microbial resistance. 1,8-naphtalimide fluorophores find application as chemical sensors and for imaging of cells, as anticancer therapeutics and as photosensitizers for photodynamic therapy because they have characteristic photochemical properties and bioactivity.
This study aims to dye cotton fabric with two newly synthesized compounds containing 1,8-naphthalimide derivatives as fluorophores, one of which emits blue fluorescence (NIO) and the other yellow-green fluorescence (NIN), to determine the colourimetric characteristics of the obtained fabrics at different concentrations of the two compounds and their resistance to wet processing, as well as to investigate their photoantimicrobial action.
Experimental part
Cotton fabric was dyed by spraying technic with an ethanol solution of two insoluble in water dyes. The obtained samples were named the same as fluorescence compounds NIO and NIN. The dye concentrations were 0.1%; 0.2%; 0.3% and 0.4% of the weight of fabric. The colourfastness to washing was evaluated with BDS EN ISO 105-C06:2010 test standard. The release of singlet oxygen was measured from textile samples immersed in KJ solution under visible or daylight irradiation. The antibacterial properties of textile samples were evaluated against Gram-positive Bacillus cereus and Gram-negative Pseudomonas aeruginosa model bacterial strains.
Results and Discussion
The colour difference delta E of the obtained textile samples were analysed. Delta E equalization was observed between their faces and backs after fabric washing. The colour parameters a* and b* characterized fabric NIO as white with a blue hue, while fabric NIN is yellow-green. More singlet oxygen was exuded from NIN than from NIO. The fabric`s antibacterial activities are more pronounced against Gram-positive bacteria. NIO is more active in the dark, while NIN is more active under visible light irradiation.
Conclusion,
Spray dyeing with ethanol-soluble compounds is a quick, easy and reliable method of depositing water-insoluble substances on fabric. An optimal photosensitizer concentration achieves good colour characteristics and photodynamic antimicrobial activity. The antibacterial textile properties depend on the type of the applied photosensitizer and the type of light.

Keywords: antimicrobial textile, spray dyeing in organic solvent, photodynamic therapy.

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Acknowledgements: „This study is funded by the European Union-NextGenerationEU, through the National Recovery and Resilience Plan of the Republic of Bulgaria, project № BG-RRP-2.004-0002, "BiOrgaMCT"rds: TiO_2 nanoparticles, textile materials, UV protection, photocatalytic activity, antibacterial activity

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APPLICATION OF INNOVATIVE TEXTILE COMPOSITES FOR SORPTION OF PETROLEUM AND PETROLEUM PRODUCTS

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Pollution of the hydrosphere by oil and/or petroleum products leads to profound, in most cases irreversible, changes in ecosystems chemical, physical and microbiological properties. These facts determine the relevance of studies related to the development of methods and means for the eradication of spills of petroleum and petroleum products.

Natural fibrous organic materials, such as cotton fiber, corn stalk and non-woven fabric (wool), are affordable and environmentally friendly. Natural sorbents provide rapid removal of oil through the pore filling mechanism, but the sorption capacity is limited by their volume. New materials and technologies are needed to clean oil spills quickly and efficiently.

In the present study, composite textile materials modified with crosslinked chitosan (sample CB) and containing nanoparticles of zinc oxide specimen (sample CBZ) were obtained. Their sorption properties against petroleum, diesel fuel and SN 150 oil were studied, as well as the possibility of their regeneration and subsequent use. The results showed that the addition of Zn ions to the surface of the composites, improves their sorption capacity. Sample CBZ was found to exhibit a higher sorption capacity than sample CB, relative to all sorbates used. The best sorption capacity, sample CBZ, is 2.2 g/g for crude oil and the lowest for diesel (1 g/g).

In the examination of the regeneration capability of textile composites, it was found that they could be successfully regenerated and reused without any significant change in their sorption capacity. This makes the materials we obtain extremely effective, as they can be used many times and at the same time allow the separation and utilization of the crude oil and petroleum products sorbed by them.

Keywords: composite textile materials, sorption capacity, regeneration.

The authors acknowledge the support through Project No 12321 Study of the sorption capabilities of innovative textile materials for water purification from oil and oil derivatives.

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ELECTROSPUN BIOPOLYMER MATERIALS LOADED WITH PHENOLIC COMPOUND WITH HIGH ANTIOXYDANT ACTIVITY

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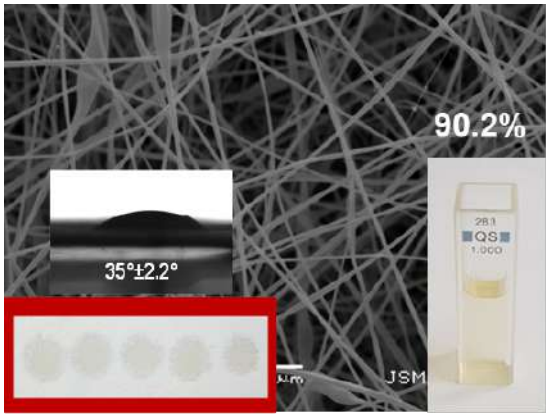
Introduction
Electrospinning is relatively easy, efficient method enabling the production of fibrous materials with diverse morphology, large specific surface area and porous structure, thus makes the electrospun mats perspective candidates for many applications such as scaffolds for tissue engineering and cell culture, wound dressings, drug delivery, cosmetics, etc. From ancient times, mankind had intense interest in different therapeutic strategies based on plant-derived medications for the treatment and prevention of some major diseases. Rosmarinic acid (RA), is a polyphenol constituent of many culinary herbs. RA possesses powerful antimicrobial, anti-inflammatory, antioxidant and even anti-aging effects. 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 phenolic compound - rosmarinic acid (RA) by electrospinning.

Results and Discussion
The optimal process conditions for the fabrication of defect-free fibers based on cellulose acetate and RA were found. The obtained fibrous materials were fully characterized by scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), X-ray diffraction analysis (XRD) and water contact angle measurements. It was found that the incorporation of the phenolic compound resulted in reduction of the fiber diameters and the measured water contact angle values. In addition, it was found that the bio-based fibers containing the RA showed high antioxidant activity.



Conclusion
RA-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: rosmarinic acid; biopolymer; electrospinning; high antioxidant activity; wound dressings;

Acknowledgments: Financial support from the Bulgarian Ministry of Education and Science (Grant D01-217/30.11.2018) under the National Research Programme "Innovative Low-Toxic Bioactive Systems for Precision Medicine (BioActiveMed)" approved by DCM # 658/14.09.2018 is gratefully acknowledged. Research equipment of Distributed Research Infrastructure INFRAMAT, part of the Bulgarian National Roadmap for Research Infrastructures, supported by the Bulgarian Ministry of Education and Science was used in this investigation.

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PROCESSING OF WASTE COTTON TO GLUCOSE AND VALUABLE CHEMICALS (HYDROXYMETHYLFURFURAL)

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Introduction

Due to the limitations of the possibilities of using fossil resources, ways to produce biofuels and biochemicals from biomass are being investigated. One of the top chemicals with high added value is 5-hydroxymethylfurfural (HMF). It is an important target product as it represents a potential substitute for petroleum-based monomers of various polymers and can be used as a starting material for biofuels. HMF can be produced by dehydration of C6 carbohydrates, among which glucose is the most suitable. It can be obtained from waste cotton textiles. The conversion of glucose to HMF is an important challenge. Biphasic systems are promising media for the conversion of glucose to HMF: high yields are obtained (THF/water/NaCl system). The catalyst also plays a key role in the rate of dehydration. Systems in which Lewis and Brønsted acidities are combined are used. Heterogeneous catalysts are preferred and can be obtained from activated carbon (AC) after modification. ACs can be prepared from waste biomass. Biomass-based ACs are becoming increasingly attractive because they can be derived from lignocellulosic second-generation biomass.

The aim was to investigate the effectiveness of prepared heterogeneous AC catalysts in the conversion of glucose to HMF in biphasic water: THF system. The reaction conditions were studied to find optimal reaction time.

Experimental part

A cotton textile sample was pretreated simultaneously mechanically, hydrothermally and by ultrasound. Two types of enzymes were used for enzymatic hydrolysis of the studied samples for glucose production. Glucose is transformed to HMF in a water: tetrahydrofuran (THF) biphasic system where the reaction is catalysed by AC obtained from almond shells i modified by zinc impregnation (Lewis acid sites) and sulfuric acid treatment (Brønsted acid sites). Experiments with different durations were conducted to find the optimal reaction time.

Results and Discussion

Glucose was obtained from a waste cotton textile sample. AC catalysts prepared were characterized with multiple characterization techniques to verify their properties. Glucose is transformed to HMF in a water:THF biphasic system and the reaction is catalyzed by the catalysts obtained. It was found that the highest yield of HMF was acquired at a reaction time of 8 h.

Conclusion

Glucose, maximum yield 16 % from a waste cotton textile was obtained. Lignocellulosic waste material, almond shells, was used as a raw material for the preparation of activated carbon-based catalysts. The prepared novel catalysts were characterized and used in water: THF biphasic system to convert glucose to HMF. The highest HMF yield 76% was obtained.

Keywords: waste cotton textiles, glucose, HMF production

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TEXTILE-HYDROGEL COMPOSITE MATERIAL-ANTI-INFLAMMATORY AGENT, WITH POTENTIAL APPLICATION AS A WOUND DRESSING

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Introduction

Wound dressings are an important segment of the medical and pharmaceutical market. Today, the dressing is not only expected to cover the wound and protect it, but also to actively support the healing process. This process is often delayed as a result of complications from bacterial infections and inflammatory reactions. It is therefore necessary to develop new wound dressings that have antimicrobial properties containing an anti-inflammatory agent to contribute to rapid wound. The aim of the study is to obtain and characterize new composite materials-hydrogel-cotton fabric with potential application as wound dressings, releasing an anti-inflammatory biologically active substance.

Experimental part

The 100% cotton fabric is dyed with modified reactive dye. The dyed fabric was impregnated with a solution of acrylamide and a crosslinking agent in the presence of MDEA, which is a co-initiator of photopolymerization. The resulting materials were characterized by determining the gel fraction, the degree of gel swelling in distilled water and in buffer solutions, the composites were examined using an optical microscope. In vitro experiments were performed to monitor the loading and release of diclofenac sodium from the samples in phosphate buffer pH=7.4 at 37°C, which was monitored using UV-vis spectroscopy.

Results and Discussion

The surface morphology of the composites was examined with an optical microscope, and it was found that the hydrogel covered the cotton fibers. Treatment of the materials with different amounts of basic monomer and crosslinker resulted in materials with different hydrogel structure, which in turn plays an important role in the loading and release of anti-inflammatory agent. The swelling of the materials in water and in buffer solutions is greater in those crosslinked with a smaller amount of crosslinker, which forms a thin layer of hydrogel on the surface of the fibres. The composite materials that absorb the greatest amount of liquids also absorb and release the least amount of diclofenac sodium, since it is water-insoluble.

Conclusion

Novel composite materials releasing an anti-inflammatory agent (diclofenac sodium) with potential application as wound dressings have been prepared. The hydrogel was found to be attached both on the surface and inside the cotton fabrics. The composite materials show that they can be used as carriers of biologically active substance. Diclofenac sodium was found to be released over 24 hours in phosphate buffer pH 7,4 at 37 °C.

Keywords: Wound dressings, diclofenac sodium, cotton fabric, hydrogels, controlled drug release

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Topic № 2
TEXTILE TECHNOLOGIES: SPINNING, WEAVING AND KNITTING

677
Textile Industry.
Technology of textile materials.

Youth revue: collection of Iva Georgieva and Joe Macchi the
Fashion Design Department at the National Academy of Fine Arts Sofia

Youth review: a collection of the Department Design and Technologies for
Clothing and Textiles at SWU Neofit Rilski with authors Milena Perchinkova and Yuliana Dimitrova

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STUDY OF THE DESIGN OF COMPONENTS FOR PERSONAL BALLISTIC PROTECTION (PBP) SYSTEMS USING CAD/CAM/CAE SYSTEMS

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The development of science and manufacturing technology tied to the introduction of innovation is the continuous drive to develop the world's armies, a process that involves daily projecting, research and experimentation, fortunately modern technology allows many of the processes to be designed and simulated virtually before any item is physically created.
Digital prototyping with CAD systems of a specific item of personal ballistic protection equipment allows the creation and study of the entire product before it is ever manufactured (Figure 1). With CAD systems, digital prototyping could easily be implemented by integrating 2D drawings and 3D data into a single digital model. This model is a virtual representation of the final product and helps engineers to design better and more efficiently. This significantly reduces development costs and time to realize new products.

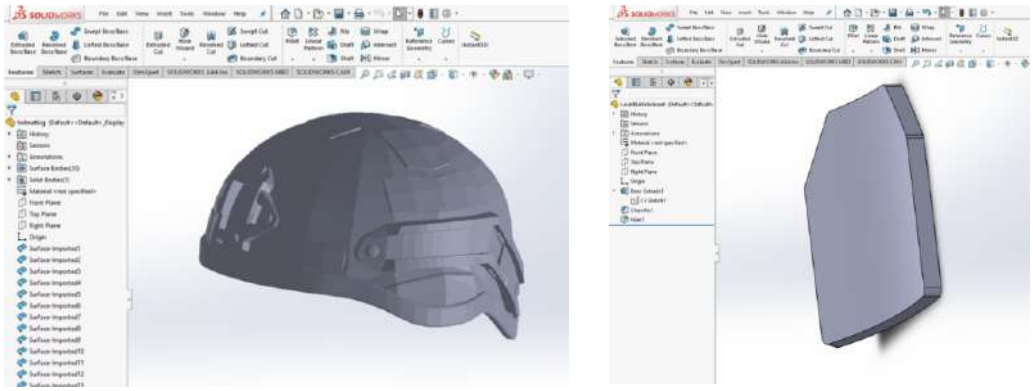

Fig.1. 3D models of combat helmet and armoured plate (SolidWorks)

In physical research, it is necessary to use n number of functional models of the existing or future product due to the need to collect sufficient data to draw valid conclusions. There is also the 'black box' effect, which is characterised by the fact that there are a large number of variables in the experiments that can influence the results and make it very difficult to understand the final outcome (need for technical means, technological systems to change geometry and mass characteristics, place to conduct the study, etc.).
On the other hand, virtual analyses implemented by CAE (Computer Aided Engineering) products (Fig. 2) provide almost unlimited possibilities to study an object and simulate it in the desired environment. These possibilities to consider a large number of indicators determine the "white box" effect that occurs precisely in virtual studies. Another plus in these analyses is the elimination of the need for physical prototypes of the object under study, as well as the possibility of immediate optimization in the models when analysing previous results. For the construction of this type of studies, good computational power and experience in the field are required in the creation of the mathematical model and the correct interpretation of the results obtained.

One of the areas where there are numerous studies and the possibility of creating models for virtual studies is the production of personal ballistic protection components (ballistic panels and inserts for body armor, ballistic shields, combat helmets, etc.).

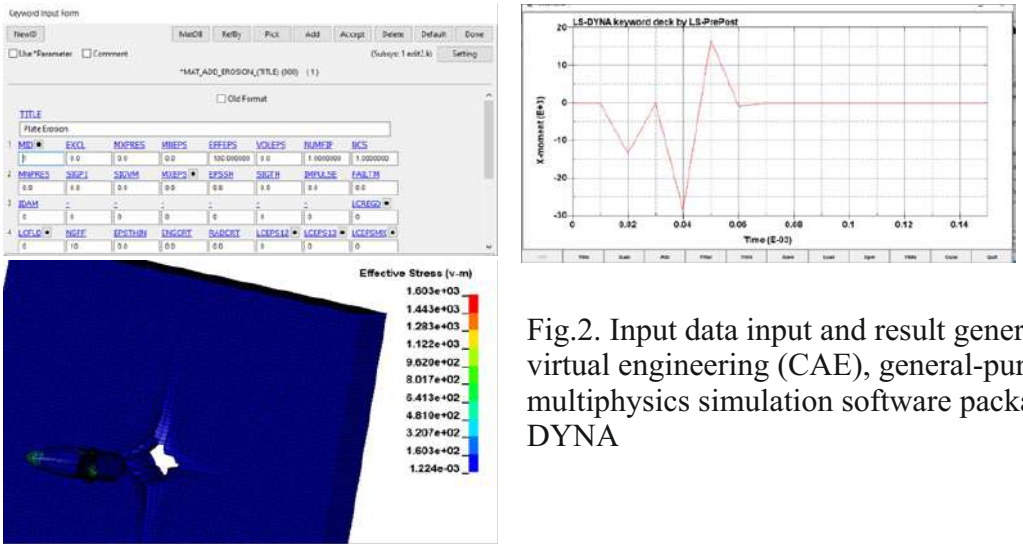

Fig.2. Input data input and result generation in virtual engineering (CAE), general-purpose multiphysics simulation software package LS-DYNA

In this regard, modern CAD/CAM/CAE systems could be successfully used for three-dimensional modeling of the individual elements of the individual ballistic protection means, from which the graphical part of the design documentation is prepared - the drawings, engineering calculations and analyses, rapid prototype preparation, technological preparation of production, preparation of control programs for machines with digital program control for the manufacture of different complexity of products entering the set, as well as for the overall management of the design

Keywords: CAD/CAM/CAE systems, personal ballistic protection, equipment, .

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USING OF FOAMS IN PERSONAL BALLISTIC PROTECTION DEVICES

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Introduction: Object of present publication are foams as a typical representative of materials, with ability to absorb kinetic energy, caused by the impact with bullet. In the publication will be analysed the possibility of choosing the most useful type of foam for the specific application in personal ballistic protection devices according to their technical parameters, without need to perform destructive tests with shooting.
Experimental part: Is made a comparative analysis of 12 different types of foams. In the analysis are included technical parameters also the results of measuring water absorption and trauma by shooting of ballistic system with ammunition.
The measurement of the amount of water absorption was carried out by weight method before and after immersion in water.
The shooting tests were carried out under the same conditions for all samples of foam: with the same ballistic system (armor plate) - same ballistic material with the same number of layers laminated to each other. To the back of the plate is bonded the test sample of the foam. The shooting was carried out with two bullets of the same ammunition - 7.62x51 mm FMG (full metal jacket) NATO, at the same locations of the sample.
Results and discussion: The foam with open cells is with the biggest water absorption – more than 200 percent above. This makes the foam highly unsuitable for use for ballistic protection, as the weight of the product will increase significantly in the event of rain or immersion in water. Also, have to be expected reduction in impact energy absorption, respectively the ability to reduce trauma, as well as the ability to protect the ceramic from cracking, by dropping from a height. The foam B50 shows the best potential for reducing trauma. B50 has the highest stiffness and deflection, and it is second in strength. No other parameter is noticeable that significantly distinguishes the foam from the others. At the same time, the BIL 1701 foam does not differ in technical parameters compared to the other foams, but it practically shows a reduction in trauma almost as with B50 foam. It is not clear the method of measuring the technical parameters noted in the table.
Conclusion: The research carried out - subject of this publication, shows that technical parameters are not enough in determining the applicability of foams in personal ballistic protection devices. This possibility will be the subject of new research and studies.

Keywords: foam, ballistic resistance, ballistic model, bullet resistance, trauma.

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5. Military and law enforcement applications of lightweight ballistic materials, A. Bhatnagar, Honeywell Inc., USA and D. Lang, sheet 6.
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7. Lightweight Ballistic Composites: Military and law enforcement applications, Ashok Bhatnagar, sh. 221
8. Materials and design issues for military helmets, A. M. S. HAMOUDA, Qatar University, Qatar, and R. M. SOHAIMI, A. M. A. ZAIDI and S. ABDULLAH, sh. 5.
9. Advances in military textiles and personal equipment, E. Sparks, sh. 114

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STUDY OF PHYSICO-CHEMICAL AND MECHANICAL PROPERTIES OF WILLIAM CAVENDISH BANANA PEDUNCLE FIBERS

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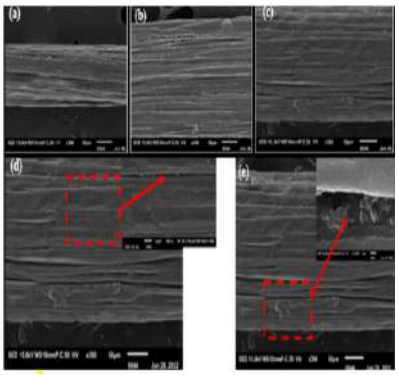
Abstract
The banana plant is a monocotyledonous plant belonging to the Musaceae family (order Zingiberales), of which nearly 70 species have been discovered. [1]. It generates an enormous quantity of biomass, including the peduncle, which is a potential source of fiber.[2].
This is the part of the banana plant that supports the inflorescence and links it to the rhizomes and fruit. To the best of our knowledge, no work has been carried out on the possibility of using this biomass in the textile sector in Cameroon.
The aim of this work is to study the physico-chemical and mechanical properties of WILLIAM CAVENDISH banana peduncle fibers for use in the textile industry.
According to the literature, several researchers have carried out studies on the extraction of fibers from banana peduncles using various methods, and on their recovery. Based on these studies [3-13], in this work, three different modes of extraction have been carried out.
The peduncles were obtained from the production residues (waste) of the PHP Company located in the Littoral-Cameroon region, Mungo Department and Njombe Penja District. Prior to extraction, the green skin is removed, using drums and tarpaulins for display, followed by biological retting with water, in the dew and mechanical extraction.

The equipment used for the physical characterization of William banana peduncle fibre (FHBW) is as follows: a mesh meter for length distribution, 100ml pycnometers for density determination; a thousandths balance for weighing; colour assessment using the Datacolor device; the JEOL JSM-IT100 for SEM observation; the VIBROMAT ME and the Projectina for the measurement of fineness and apparent diameter respectively. With regard to chemical properties, the Van Soest dry biomass fractionation method was used to determine cellulose, hemicellulose and lignin content; the Infra-Red was determined using a BRUKER IR Spectrometer; the NETZSCH STA 449F3 ATG and the X-ray diffractometer were used to determine the thermal stability and the amorphous and crystalline fractions of the FHBW respectively. With regard to the mechanical characterization of FHBW, the tensile test was carried out using the MTS and the flexural test using the KAWABATA module.
The fibers were extracted by three methods and the fiber yield assessed. The results show that water retted fibers have a higher yield compared to dew retted fibers and fibers extracted by lamination. According to the Barbe and Hauteur length analysis, the retted fibers show a good balance with few classes of long and short fibers and a large class of medium fibers compared with the laminated fibers.
SEM observation shows that the fibers extracted by the three methods are in the form of fibers bundles. The fibers extracted by lamination still contain pectin's, in contrast to the visibly smooth fibers extracted by retting. [11]. The longitudinal structure is in the form of small flat ribbons, whatever the extraction

method.
As far as cellulose is concerned, it can be seen that extraction methods do not have a major influence. On the other hand, the cellulose content of laminated fibers (74.8%) is higher than that of fibers retted in the dez (73.6%) and in water (71.8%). These cellulose contents are higher than those of Musa acuminata peduncle fibers found in the literature[11].
From the various thermograms obtained, we can see that WBPF are thermally stable up to 82°C. We can conclude from this result that fabrics made from these fibers can be ironed at temperatures below 82°C.



The diffractograms at show that the crystallinity index of the fibers extracted by lamination is more significant (69.53%) than those obtained with water- and dew-retted fibers (58.24% and 54.83% respectively). This low value may be due to the presence of non-cellulosic substances on the fibers.
Looking at the tensile curves, we can say that the extracted fibers have a behavior close to linearity with little viscoelasticity, whatever the extraction method. This type of behavior should lead to rather brittle fractures.
Analysis of the fracture surfaces of the extracted fibers reveals a hollow fiber structure, composed of small, thin-walled, juxtaposed tubes. The facies confirm a brittle fracture mode; the brittle nature of plant fibers has been demonstrated in the literature by Maria et al.[12].
Similarities were observed between the tensile and flexural mechanical properties of fibers obtained by spinning.
The tensile test shows that the fibers retted in the field have lower values than the others; the tenacity of the laminated fibers is higher (58.83 cN/tex) than that of the other methods; however, it is still in agreement with the results of the chemical composition, while the flexural analysis shows that the laminated fibers are stiffer than the retted ones. in comparison with the literature, the tenacity of William banana peduncle fibers is higher than that of flax and sisal fibers, which means that these fibres can be used in textiles [13].
The flexural stiffness values for the different fibers lead to the conclusion that the retted fibers are less stiff than the fibers obtained by lamination.
From the results presented, it can be said that William banana peduncle fibers extracted by the three methods are suitable for textile applications. However, the laminated fibers could be softened for better exploitation.

Keywords: William banana peduncle fiber, physical-chemical and mechanical properties, SEM

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POTENTIAL ENERGY EQUILIBRIUM OF THE ELASTIC DEFORMATION IN THE TWISTED FIBROUS SHEAF

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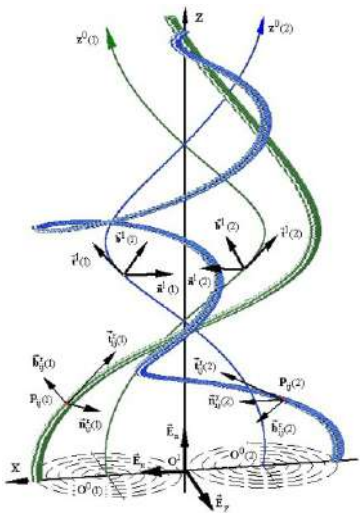
The initial equilibrium state of the fibrous sheaf is straight parallel fibres without deformations and stresses, with a negligible level of elastic energy. The cross-section of the sheaf is close to a circle, in which the fibres are uniformly arranged, and after twisting, each fibre acquires a spiral shape.
The strength-strain process is carried out alternatively by 2 independent arguments: the strain or stress, displacement or force. In the present study, the externally applied argument is deformation, i.e., the relative elongation ε along the axis of a fibrous sheaf of twisted fibres - thread.
Integrated over the h-height of a thin plate of the sheaf cross-section, the relative elongation acquires metric displacement dimensions: $h\_i=\varepsilon$. Each of the fibres in the already twisted sheaf has a static shape that orients the axes of the local coordinate system. The same for all fibres displacement hi along the axis of the sheaf is projected along the axes of the local coordinate system $\Omega\xi\eta\zeta$ of each fibre. The local projections lead to 3 linear and 3 angular displacements: longitudinal and torsion along the ζ tangent, shear and bending about the normal ξ and about the binormal η. Referred to the orthogonal surfaces of the fibres cells, the projected displacements are distributed as elements of the strain tensor $\underline{\underline{\varepsilon}}$. The natural values of Young's modulus and Poisson's ratio give the linear relationship between applied strains and induced stresses $\underline{\underline{\sigma}}$ on the fibre cell walls. The components of strains and stresses make up the total potential energy field of elastic deformation. Conversely, the integral, generalized sum of stresses from the stress tensor $\underline{\underline{\sigma}}$ on the cell walls gives the unit effort of each of the fibres and finally the elastic resistance of the entire sheaf.



When visualizing the computational model, the elongation and reaction of the fibrous sheaf represent the coordinates of the analytical rheogram of the strength-strain process.
The strain-stress equilibrium of the elongated thread is due to the distribution of uniaxial elongation into unit displacements along all fibres and the redistribution of unit displacements into multi-component linear and angular strains in the fibril structure of the fibres. An equilibrium evaluation is the calculated value of the potential energy of the elastic deformation.
Subject of this paper is the equilibrium between the uniaxial elongation of the thread and multi component efforts of the fibres in the fibrous sheaf.
The purpose of the development consists in the creation of a computing device for determining the elastic resistance of textile threads and visualizing the analytical model of the strength-deformation process.

Keywords: textiles, fibrous sheaf, stain-stress tensor fields.

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MILITARY CLOTHING IN THE BULGARIAN ARMY – PAST, PRESENT AND FUTURE

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The introduction of a uniform in the Bulgarian army makes it possible to clearly distinguish the servicemen from the civilian population; to emphasize: national identity, belonging to a certain kind of army and social status. The military uniform allows the servicemen to be maximally protected from various climatic features while performing their military duty.

The development of science and technology makes it possible for military clothing to be developed from innovative materials, meeting the increasingly high needs for the protection of military personnel.

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REQUIREMENTS FOR THE FABRICS AND MATERIALS SUITABLE FOR THE CONSTRUCTION OF MILITARY UNIFORMS

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Military clothing should allow for activities that are often physically demanding while providing protection, information superiority, and maintaining capabilities, durability, and mobility, protecting them from environmental threats, reducing impact, and providing them with all the functionality they need. In the context of increasing world conflicts, the question of how well people are protected on the battlefield remains increasingly important. Recently created military conflicts require measures to be taken that can secure the protection, communication, comfort, and guarantee capabilities of everyone involved in national and global security. In this context, of particular importance is the introduction of smart and multifunctional textiles, a new generation of materials and systems with multifunctional properties that, given their ability to be integrated into uniforms, have attracted the attention of the defense community. Smart textiles are defined as textiles capable of interacting with their surroundings: they react and adapt to a given stimulus. Functional textiles provide an additional and specific function through their composition, construction and/or finish. Typically, these features include increased mechanical resistance, water and/or dirt repellency, fire retardancy, antibacterial properties, protection against UV, pests or chemicals, thermal insulation, etc..

Smart and multifunctional textiles pave the way to multiple possibilities for developing high-tech garments that meet multiple needs in an elegant solution. These materials allow the integration of various components and devices in a convenient and ergonomic way, providing a wide range of functionalities. In addition, these textiles also offer new opportunities for integration with platforms and systems.

An example of a challenge associated with physically demanding work in harsh environmental conditions is managing heat stress. Uncompensated heat stress can lead to loss of physical and cognitive performance, as well as life-threatening heat-related illnesses. The main reason is the conditions specific to military service: The soldier is a hard physical job, often in protective clothing due to complex threats (e.g. ballistic vests, ballistic protection equipment), whose insulating properties are of great importance, especially in areas with hot climates.

Another key challenge in the defence context is to ensure that soldiers have the best chance of survival through prompt and life-saving medical treatment when they are seriously injured in a military conflict or combat situation. With a large number of seriously injured soldiers, a rapid and accurate assessment of the critical status of the wounded is necessary to calculate the number and priority of treatment by emergency physician triage. If vital signs such as pulse, blood pressure, oxygenation, and electrocardiogram can be determined quickly and transmitted by the casualty using portable sensor systems wirelessly to the emergency physician who performs the triage and first medical treatment, the efficiency of care and the chance of survival can be improved.

Smart and versatile textile materials also propose the opportunity to provide additional functionalities that will have a major impact on soldier safety, performance and well-being. The soldier of the future will need technological solutions to detect and monitor information coming from both his surroundings (such as threats) and his physiological state (parameters related to the soldier's experience of stress and his state of health, etc.) Another important aspect is the ability to know his location with a high degree of accuracy, and to be able to receive and provide information related to his current state.

Smart and multifunctional textile materials allow the integration of various components and devices into uniforms and military systems and extend the range of their functionalities. To address challenges such as those listed above, functions may include environmental and soldier physiology monitoring, localization, communication, energy management, and protective functions (e.g., environmental protection, signature reduction including thermal radiation, fire protection, electromagnetic radiation protection, and neutralization of hazardous chemicals).

Textile materials for military uniforms in the foreseeable future must provide the ability to distribute, provide/convert energy and/or store energy to support some of the above functions.

Keywords: Smart and multifunctional textiles, military clothing.

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DEVELOPMENT OF POLYMERIC BRAIDED STENTS

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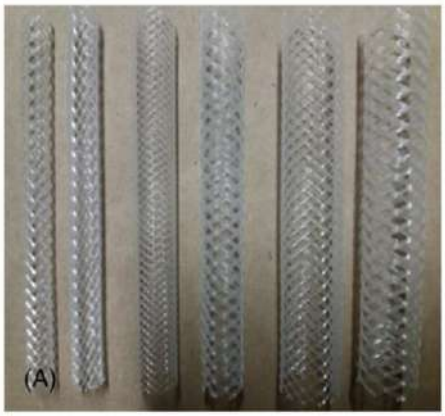
Metallic stents have been largely used over the last decades to treat vascular diseases like coronary artery or peripheral vessel stenosis. Although they remain the gold standard for vascular treatment, they are subjected to in-vivo complications such as corrosion, structural failure, fractures, and re-stenosis due especially to the material which is used. Polymeric stents were developed as an alternative to replace commercial metallic ones presenting several failures caused especially by the used metals. Among those materials, the polyethylene terephthalate (PET) have been used to develop stents since PET is suitable for several biomedical uses such as vascular prosthesis. Braiding technique was used since it provides flexible structures. In this paper methods and materials for the development and characterization of PET braided stents were given and the main results were highlighted.



Results bring out that PET braided stents show very promising structural and mechanical performances comparing to metallic stents. They guarantee in particular a good flexibility and stability to cyclic loadings predicting their long-term behavior. As a conclusion, PET-braided vascular stents show a huge potential to replace commercial stents but their manufacturing parameters should be carefully chosen. Despite advances in cardiovascular stent materials and designs to decrease post-deployment complications, starting from the "Wallstent" implanted in 1986 until today, problems such as corrosion, structural failure and fractures causing inflammation, early thrombosis and in-stent re-stenosis are still existing. These complications are mainly due to the metallic material used as well as to the structure itself, more precisely, to a poor tolerance of the organism to their long-term presence, to an excessive rigidity causing a high mechanical stress on the vessel wall, to a lack of flexibility especially in tortuous arteries or to a low resistance to fatigue caused by in-vivo cyclic displacements due to the blood flow, etc. For this, stents are classified by the European authorities as the most implantable medical devices showing important risks of local and general complications after implantation. Research is advancing on all fronts, especially towards the use of other materials. Among the solutions that could be promising in reducing complications related to commercial stents, several research groups developed and characterized polymeric vascular stents, braided or knitted, using non-biodegradable polymers such as polyethylene terephthalate (PET), polypropylene (PP), polyurethane (PUR), polyamide (PA), etc. From the results, PET-braided stents are found to be the best candidates to replace metallic stents. This study gives a review about polymeric non-biodegradable stents, and then summarizes and discusses the main findings about PET-braided vascular stents.

Keywords: Polymeric stents, non-biodegradable, PET, braiding.

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COMPOSITION OF WORKING PROCEDURES AND INSTRUCTIONS FOR THE QUALITY OF RAW FABRICS

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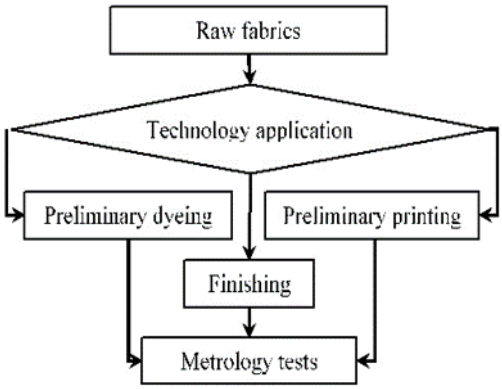
Raw fabrics can be patterned in three different ways: dyeing the fibers before weaving; dyeing after weaving; printing after weaving. The problem that will be considered in the development is that different fabrics have different technical characteristics and different technological processing.



Fabrics that are designed at the level of fiber dyeing are subject to further technological processing, which includes only the processes of refinement - washing, fixing and relaxation. The other part of the fabrics, which are woven or knitted before the threads are dyed, are subject to dyeing, by applying dye in a dye bath or applying a pattern to the textile material by means of transfer or direct printing. For this reason, the working procedures for the quality of raw fabrics are compiled in a hierarchically constructed algorithm and carried out by corresponding instructions.

The instructions contain a set of ordered laboratory tests in accordance with standard sampling and testing methods. The instructions are graphically presented as A5 or A6 size labels and accompany the specimens through the series of tests.

The first testing procedure to which the fabrics are subject consists in checking the main parameters - width and area mass. Subsequently, we move on to determining the structure and fiber composition of the textile surface product - the thread densities, linear density, warp and the composition of the threads in the fabric are examined. The next stage of the work procedures is the determination of the mechanical resistance of the fabrics - strength to breaking or cracking strength and surface friction resistance. Depending on dyeability, fabrics are test dyed to determine dye affinity and possible unevenness in bath dyeing and printing.

Different variants of working instructions are outlined, which are accompanied by different laboratory activities.

Work procedures are implemented in the daily production activity through instructions that aim to guide the activity of the laboratory and quality control, with the aim of reducing the consumption of test samples and laboratory activity.

The subject of this article is the compilation of procedures and instructions for quality control of raw fabrics within the BDS EN ISO 9001 quality assurance system.

The aim is to draw up rules and strengthen quality control activities.

Keywords: fabrics, quality control, work procedures and instructions

Topic № 3
APPAREL TECHNOLOGY

687
Tailoring (apparel) Industry.

Youth revue: collection of the specialty Construction and modeling
of clothing from textiles in PGO Princess Maria Luisa - Sofia led by Eng. Maria Koleva

Youth revue: students collection from the specialty Clothing production from textiles
from ISU Metodi Draginov - the village of Draginovo, led by Eng. Elka Djurakova

https://doi.org/10.53230/tgm.1310-912X.2023.0010.22

SEAM PERFORMANCE OF MOTORBIKE SUIT

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According findings, the worldwide automobile industry's fastest expanding product is the motorbike. Since it is crucial [1] for motor bikers protection and help in lowering the risks and seriousness of injuries [2,3], wearing proper personal protective equipment is required in many countries [4] to increase its safety on the road. Consequently, in 2002, the European Standard EN 13595 for "Protective Clothing for Professional Motorcycle Riders" was established. However, Europe recently created a new garment protection standard called EN17092 that complements EN 13595. Achieving this criteria should result in improved seams because the bulk of motorcycle apparel currently on the market has not previously been certified for seam strength [5].

Kevlar is a very strong synthetic fibre, invented by Stephanie Kwolek in 1965 and manufactured by DuPont. This fibre is mostly renowned for its tensile strength, heat resistance, ballistic resistance, and resistance to cuts and punctures. These factors contribute to its widespread use in the motorbike industry as well as the automotive, aerospace, and military sectors [6]. On the other hand, Coolmax fabric offers breathability and moisture management, making it a fantastic option for consumers seeking best possible comfort.

Stitching and seaming are still most dominant and efficient techniques of joining garment parts and creating 3D garment form. Since the seams have significant impact on the quality and appearance of the finished garment, the performance of the seams must accompanies the performance of the garment. There is no value having the world's hardest denim if it falls apart at the seams. This is why, for creating protective and safe clothing, the seam strength is one of the key variables [6]. Finding the CE emblem stamped on a product's label, which confirms testing in accordance with the necessary standard, will help you choose better motorbike clothing or active wear [7].

The objective of the paper is to evaluate the performance of various seam types of motorbike suit. Seams investigated were of seam class 5, type 5.01.01 having three layers of fabrics (coolmax – Kevlar - coolmax), connected by stitch type 301. The second seam is of seam class 1, type 1.01.02, of two fabric layers (coolmax - kevlar) connected by stitch 401.504. Stitch type 301 is formed with two threads, needle and bobbin thread, while stitch type 401.504 is overlock safety stitch [8]. Kevlar type of fabric is one of the most famous type of materials for motorbike clothing, providing adequate protection for wearer [4], while Coolmax fabric as moisture-wicking polyester and "breathable" fabric, providing wearer comfort.

The testing of the seams is according standard EN 13594:2015, Protective gloves for professional motorcycle riders. The test involves pulling a seam apart using CRE tensile testing machine and measuring the maximum force until seam failure. The clamping jaws distance is 30mm. The results of investigation are shown in table 1.

Table 1. Seam breaking strength

Seam type	5.01.01	1.01.02	
Stitch type	301	401	504
Force [N]	526.3	210.6	258.6
Elongation [%]	211.8	150.1	45.1
Extension [mm]	63.6	217.5	65.3
Seam strength [N/mm]	21.1	8.4	10.3

The results for seam breaking strength are calculated by dividing the breaking force by the width of the tested seam (25mm). The seam strength for the first type of seam is 21,1N/mm. For the second type seam, the seam strength is 8.4N/mm and 10.3N/mm, for the stitch type 401 and 504 respectively. The seam type 5.01.01 remains undamaged during testing and the seam strength equals breaking strength of the fabric. The second seam type, 1.01.02, show two peaks of breaking strength. The first peak is the moment of breaking the stitch 401 and the second peak is the point of breaking the overlook stitch 504. The seam failure of this seam is a result of the sewing thread breaks and the fabrics in this case remain undamaged.

The fabrics strength were also investigated, and the Kevlar fabric shows high breaking strength in both testing direction, while the coolmax knit shows much higher strength in longitudinal direction. Obviously, the seam type 5.01.01 show high breaking strength due to seam configuration, where the thread just quilts the fabrics together and does not contribute to seam strength. Therefore, this seam falls in AAA class in the first zone (almost 75% higher) according to the standard EN 17092. In addition, the strength of the seam 1.01.02 is within the limits of the standard for different zone and class, because the failure of the seam is the result of breaking of the sewing thread. Based on these results, it is to expect that the performance of this seam type can be achieved applying sewing thread of higher strength.

Keywords: seam, breaking strength, motorbike clothing

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LADIES SPORTS DRESS

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These days every woman can find at least a few pretty dresses in her wardrobe, for various occasions. The dress is a symbol of elegance and femininity, perfect for every day, a best friend. The woman's dress is a upper-shoulder garment, known to people since ancient times. As far back as Ancient Greece women wore fabrics wrapped around their bodies, which were tried at the waist and fixed at the shoulders using fibulae.

Today buying a fashion item is like going out for an afternoon coffee – it is a reason for a good mood. We don't even think about how long a garment's journey is to become our favourite acquisition. An idea needs to find the right fabric and material combination. It is a huge amount of work from a constructive point of view, and no less from a technological one.

We are looking at a model development of a ladies' sports dress, using the Bulgarian State Standard (BSS/ БДС), applying it to construct a drawing of a basic construction of a ladies' dress in semi-fitted silhouette and showing the basic steps of creation of said model. Different methods have been applied to transform folds, which present the rich tools in construction and modeling to achieve a more advanced model development.

The garment flares from the waist down, which contributes to the comfort of wearing and freedom of movement. The dress combines two colours, with the darker used to make the side pieces elongate and make the silhouette more fitted, making it suitable for shorter ladies. A detailed technological sequence for making the garment has been developed with the necessary patterns and technique used. The production follows a specific order of steps and material processing using a various set of machines and tools. The model is made life-size at each point of the design, which is a testament to the value of the methods used.

It is an extreme advantage to have a sports dress made from breathable and soft fabrics that caress the skin. The journey an idea goes through is sometimes too long and difficult. The final touch always brings satisfaction, especially the gleam in a lady's eyes, with a beautiful and comfortable dress.

Keyword: construction and modeling, model development, technology

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REGULATIONS IMPACT ON SUSTAINABLE DEVELOPMENT OF CLOTHING

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These days, the concept of sustainability is extremely relevant in the fashion world. The market is practically a maze of offers and everyone is trying to reach the light at the end of the tunnel. It is vital for consumers to be informed on how to competently choose sustainable textile products of high quality.

This article provides basic guidance on what is really high quality and is truly in line with the ecological needs of our planet.

Organic materials are grown according to the standards for organic farming, and the ones most commonly used are cotton, jute, silk and wool. The category of organic textiles includes clothing and home textiles, and in practice the requirements for certification and origin are the same. Organic cotton is generally defined as cotton that is grown from non-genetically modified plants, and without the use of synthetic agricultural chemicals such as fertilizers or pesticides.

Organic means natural and it's something that provides benefits for the environment. This practice combines tradition, science and innovation to benefit the environment and ensure everyone and everything involved a good life quality. No product is 100% sustainable, but the aim is to educate and raise awareness of sustainability in production, business and consumption.

There's a high quantity of sustainable and ecological certificates for textiles at the European and international level. Recognizing all of them is overwhelming, if not impossible, but it is of key importance for people to be aware of the most important ones to avoid being misled. Sustainability certificates provide information on the origin of the materials used, animal welfare, sustainable production, recycling, social responsibility, etc. The goal is for everyone to be informed so they're able to make a choice and prioritize the planet.

Keywords: organic, ecological, social, principle of sustainability.

Topic № 4
TEXTILE ART AND FASHION DESIGN

658.512.23
Artistic design
(industrial design).

Plenary lecture by Prof. Saber Ben Abdessalem from ENIM - Monastir, Tunisia,
Session Chair - Prof. A.S. Sarac from TU-Istanbul, Turkey

Plenary lecture by Mr. Adriano Oggioni from Picanol n.v., Belgium

https://doi.org/10.53230/tgm.1310-912X.2023.0010.25

APPLICATION OF ARTIFICIAL INTELLIGENCE FOR THE DEVELOPMENT OF SUSTAINABLE FASHION INDUSTRY

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At the beginning of the 21st century, technology had already started affecting our lives. Artificial intelligence (AI) and robots are already part of our lives. The fashion industry is also rapidly changing technologically.

Digitalization and artificial intelligence provide many opportunities for fashion brands as well as determining the successful development of various business models. AI has been very successfully applied by predicting fashion trends and significantly increasing efficiency in many of the stages of the logistics chain. The imposed trend to transform the fashion industry in accordance with the contemporary global trends of digitalization, sustainability and circular economy also implies the application of AI.

This article examines the key technological trends in the fashion industry provoked by digitalization: Visibility and traceability; quality management; logistics 4.0. The application of artificial intelligence (AI) in the fashion industry is consistent with the understanding that artificial intelligence is not a technology, but instead a description of how the systems that are using it, work. Modern practical applications of AI are of the *Narrow AI* type-involving intelligence established only when performing specific tasks in one application area. The benefits of applying AI to the fashion industry are threefold: Design; marketing; supply chain management. It can be claimed that the concept of sustainability can be recognized more effectively thanks to the benefits of applying AI in: reducing waste and pollution, online shopping for clothes and extending their life, 3D design and virtual fitting, personalization in measurement, purchase and service. And the primary directions in which artificial intelligence can help develop sustainability in fashion and the development of sustainable business approaches and models are: Creation of sought after products and services; opening up new business opportunities; sales performance; waste reduction; improving customer satisfaction; generating more sales; increase profits; streamlining the supply chain; saving time and money; getting ahead of the competition.

While AI demonstrates the potential, it also sets new challenges that businesses can to address. As with any technology, the pros and cons of AI in fashion are a matter of perspective. In addition, with the right approach, businesses can use AI to cause growth and improve the bottom line using human-centric approach, demanding personalization and concerns about the environment and society. AI should be introduced in a way that encourages creativity and diversity. This can deliver a significant impact on the fashion industry as well as the economy as a whole.

Keywords: artificial intelligence, sustainable, fashion industry

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ARTIFICIAL INTELLIGENCE IN FASHION DESIGN

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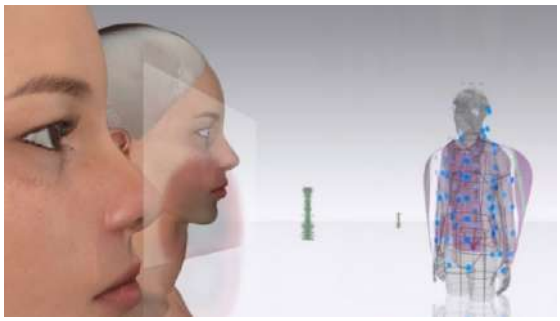
The development of artificial intelligence (AI) technology in all areas of human presence on planet Earth and beyond cannot be stopped. And it is not necessary, because progress is also related to overcoming the limitations in the abilities of the human individual, which is actually the main role of AI. The textile industry and in particular the fields related to the design of textile products are no exception and people related to this branch should be well informed in order to position themselves with their useful presence in a not always correct environment of AI applications, as and participate in the creation of such applications.

This paper examines the latest trends and advances in the use of artificial intelligence in the fashion industry, focusing mainly on AiDLab - the first research platform that focuses on the integration of artificial intelligence (AI) with design. Also introduced is AiDA, a first-in-the-market technology that enables fashion designers, based on their creative inspirations, to work with AI to create original designs. AiDA begins its work by initially recognizing the design inspiration through the selection of a conceptual board (board, picture) - mood board.



Likewise, the authors begin their article by challenging anyone reading to initially recognize their own attitudes toward AI in general. Keeping in mind the undeniable benefits to society of the achievements and use of AI, a brief emphasis on current negative phenomena and harms of the use of AI is expressed, and the most dangerous quality of AI is also fixed - the complete elimination of the need for human mediation and our ability for wisdom.

Basically, the concept is developed that the development of technology cannot be stopped and everyone must find their progressive and sustainable place in the processes. To better understand the inner workings of AI systems, incl. and in fashion design, a specific machine learning model is presented for knowledge acquisition and storage.

All six major stages of a designer's work are covered: Theme/Concept Identification, Design Element Research, Ideation, Design Refinement, Mock-up and Prototyping, Model Assembly.

The authors also mark the main applications (they think) of artificial intelligence in fashion - Design and creativity, Generation of design ideas, Customization of fashion, Sustainability and production, Marketing and customer service, not forgetting the trends and challenges.

Keywords: fashion design, artificial intelligence

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MODEL DEVELOPMENT OF A BULGARIAN NATONAL COSTUME FOR A WEDDING

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Every second on this planet we breathe without even thinking. We are born with a huge breath of air and then we are dressed. Our body breathes, but through our clothes.

Necessity or dependence coming from ancient times?

The appearance of the first garments dates to before Christ, constantly undergoing development, with the clothes of different nations and civilizations being their business card. So is the Bulgarian national costume, which is one of the most iconic and unique symbols of our nation worldwide. According to scholars and historical sources, the patterns and ornamentation of our national dress have been known in the Balkan region for at least 3 500 years, which means that we ourselves are an extremely ancient and valuable nation in European history. Research by some thracologists in the 1970s and 1980s claims that the ancient Thracians wore, as well as depicted their idols with, "garments" whose style and ornamentation closely resembled ours that we know today. This may lead us to the solid theory that we are most likely not "outsiders" come from Asia, but indigenous peoples to the Balkans. We also find that our clothing is mainly of Slavic origin but contains elements of nations with whom we have interacted with over the years - Turks, Greeks, Albanians, Vlachs.

What we are going to look at in particular is an model development of a Bulgarian costume from the area of Kyustendil, dating back to the mid-19th century, made on the occasion of one of the most important occasions in the life of a person, in this case, of a happy lady - the wedding.

The components of the ensemble are a shirt, a saiya, an apron, a belt with pafti, a cloth tied at the waist, and a headscarf. The making of the ensemble is almost entirely from recycled materials, for example the fabric for the apron and the embellishments on the saiya are bought from a second hand shop, the headscarf is a repurposed scarf and the pafti are borrowed.

We have created a jewel carrying the authenticity of our culture, and on a shoestring budget we are on trend for sustainable fashion.

Yet we want to continue to breathe on this planet!

Key words: tradition, reenactment, Bulgarian national costume, fashion sustainability

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ORGANIZATIONAL PROCESS OVERVIEW IN GARMENT MANUFACTURING UNTIL THE BEGINNING OF THE 21ST CENTURY

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Abstract

The production of ready-made clothes is a complicated process. The first attempts at mass production of garments date from the middle of the nineteenth century. A revolution in the clothing industry occurred in 1857 namely when Isaac Merritt Singer (27.10.1811 – 23.07.1875) patented and introduced an improved model of a foot sewing machine.

With the elaboration of a system consisting of consecutive processing operations, which require a lean and exact organization to achieve effective results, the commercial clothing industry developed through the years to its present condition. The current text footprints the various stages of this organization, by exploring the correlation between each one of them. The order of the enlisted activities is not random. The role of each one of them is extremely important for the completion of the ready-to-wear product and its initiation to the commercial sites and respectively to the customers.

The purpose of ready-made clothes production is the crafting of wear and accessories for men, women and children from different cultural, ethnic and economic social stratums and population groups. The ready-made manufactured goods are executed in standardized sizes. The model of organization of the whole process depends on many factors, such as what type of garments are being produced, and for what kind of customer they are made – for one's own distribution or for an external trader. Also, the organization is defined depending on the capacity and the size of the manufacturing company, the number of workers, commercial sites etc.

The production of ready-made clothes includes processes such as: preliminary research considering economic deliberations, commercial realization, and market demand; fashion trends and novelties; selection of fabrics and materials for production; design; patterns and stencils making, creation of technological production cards; fabric spreading process and cutting; processing; pasting; assembly; sewing; ironing; finishing and handmade operations; quality control and labelling. The end products are intended to be offered and negotiated for wholesale or retail markets, the goal is purchase and wear by the end user – the customers.

The process of optimization of the working cycle continues to this day.

Keywords: organization, ready-made garment production

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POV – THE WAY ALIENS SEE US

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Who are they? Can we imagine what they see? What if they exist? What if the aliens are us? If we accept that everything is possible then everything is possible.

"Arrival", "Sighs", "Interstellar" and many others. Movies with the concept wrapped around the idea of how we visualize aliens and our first contact with them. What if we swap the point of view? How would THEY see US?

Space age. We immediately think of Star wars or fashion inspired by science fiction. "Space Age" is heavily influenced by the so-called Space Race. "Space Race" is a "competition" in space exploration between the two Cold War rivals USA and USSR in the period 1957-1975 for dominance in space flights. People were fascinated by space and science fiction in the 1950s, so a really fun trend developed in the 1960s with movements in fashion, the advertising business, popular science fiction books, movies and TV series like Star Trek, Dan Dare or Lost In Space. Robots, satellites and a trip to the moon are helping to make what was once only a fantasy a reality. The trends from these novelties therefore permeate art, fashion and all visual arts.

In my collection I've expressed a very detailed and delicate design process in which I have deconstructed and constructed the so familiar silhouette of the classic outwear coat. I have played with unusual capitone fabrics to create that luminescence feel in the touch as well as in the photo shoots of my designs. Among the fabrics are: velvet (silicon ball), polymer cotton fabrics like circular knits, wool and application of resin coating to give the metallic sheen to some fabrics. I have used mostly "V" shaped and "I" shaped silhouettes in the collection to create that feeling of a wrapped-around "object" that the human plays to be.

Keywords: fashion collection, aliens, luminescence, coats, outwear, reconstruction

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WEAVING KNOTS AND THEIR IMPACT ON THE ARTISTIC TEXTILE CREATED ON A VERTICAL LOOM.

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Nowadays, with the availability of machines in all their forms, hand weaving on a vertical loom, thread by thread, is a particularly special process. The tradition of classical tapestry has been preserved and is practiced to this day in the Artistic Textile speciality at the "Dimitar Dobrovich" National Art High School - Sliven.

Parallel to the tradition, the students' searches in the direction of modern artistic textiles are also present, which necessitates the incorporation of various textures into the smooth tapestry. This is achieved through the weaving knots, which can create many different textures, small, medium and large volumes in the fabric. Appropriately combined, they contribute to the overall harmony of the composition in the artwork.

One of the main weaving knots that is used is "sumac", also known as "through hand" , as it can acquire a different appearance, depending on the type and thickness of the material with which it is filled as well as the distance from each winding.

Another essential technique is the tufted rug technique or the so-called "tied technique". It consists of tied bundles of yarn in knots, on the warp so that they form a tufted rug. This technique is very characteristic of the making of bedding fabrics, but has been also successfully applied in the field of wall carpet and it is most often combined with smooth tapestry and other less voluminous weaving knots.

Traditionally for the creation of the smooth tapestry, a cotton warp is used, twisted wool yarn, silk thread, cotton or a combination of these. The weft and the base must not have the property of elasticity. No matter which weaving knot is chosen, an important technological feature is to reweave with a thin yarn after each row is completed to give the fabric density and stiffness.

When we talk about the contemporary artistic textile, we may come across works that incorporate quite unconventional materials. Some of them are cotton and hemp ropes, sisal, coconut fibers, nylon, etc. The techniques by which they are integrated into the tapestry are numerous, and the work on a vertical loom allows the students to create new weaving knots, based on the main ones, in the process of work. Encouraging experimental work like that helps to develop their artistic skills.

Keywords: weaving, vertical loom, weaving knots

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AUTHENTICITY AND STYLIZATION OF THE FESTIVE WOMEN'S COSTUME FROM THE CHEPIN REGION - THE VILLAGE OF DRAGINOVO

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The costume is a general term for the folk traditional clothing of the Bulgarians from the Renaissance to the middle of the 20th century. It intertwines the beliefs, traditional culture, life and lifestyle of the Bulgarian people.

Clothing occupies an important place in folk culture. Through its fabric, color, cut and decoration, clothing indicates a person's nationality, residence, gender, age, marital status, occupation, social affiliation and religion.

A relatively independent part of the renaissance clothing of Bulgarian women is the festive women's costume from the Chepin Valley. From an initial study for the period of the 60s of the 20th century, its main parts with the characteristic dialect names of the area were established:

- White shirt with embroidery on the chest;
- Atlas;
- Kurk;
- Gland (pafti);
- Pishtemal (apron);
- Printed socks;
- Hat;
- White and red head covering.

All parts are handmade: woven, knitted, embroidered, etc.

The present study is descriptive in nature. The emphasis is on the authentic Draginovo's costume from the 60s of the 20th centuries and that of the 21st.

The subject of this article is the comparison: from past to present in the women's holiday costume from the village of Draginovo.

The purpose of the development is in two directions.

First to study, describe and update the terms and names of the parts of women's costume.

Second, to explore and describe the difference between the hand-made costume of the past and the current industrial production with modern technological equipment in sewing production.

Keywords: folk female costume, analysis, terminology

Topic № 5
TEXTILE MACHINERY AND EQUIPMENT

677
Textile Industry.
Technology of textile materials.

Plenary lecture by Prof. Goran Demboski from the University
of St. St. Cyril and Methodius in Skopje, Republic of North Macedonia

Plenary lecture by Assoc. Prof. VU Thi Hong Khanh of Hanoi University
of Science and Technology, SR Vietnam

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STUDY AND DESIGN OF AXIAL CAM OF 8-NEEDLE HEAD FOR KNITTED CORD

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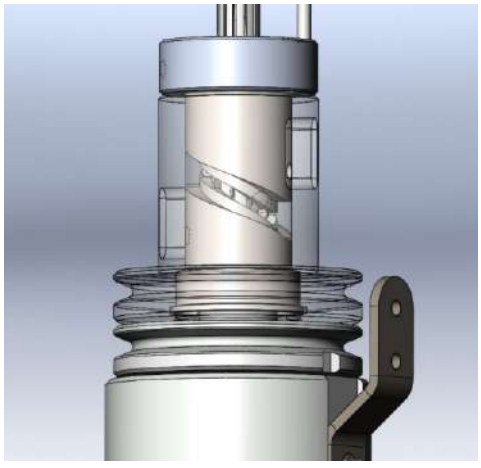
The hybrid cord knitting head is a multi-functional device for making linear textiles. The dual nature of the device is expressed in the simultaneous possibility and alternative choice of the thread receiving a knitted and/or twisted structure.

Knitting heads with 6 to 12 heads are known, in which 1 to the maximum number of needles can be loaded. The loop is formed by the vertical movement of the needles, which, according to the well-known scheme of loop formation, catch and entangle the thread. The peculiarity of this apparatus is due to the formation of 8 looped pillars for one revolution of the head. Thus, for one machine cycle/head revolution, each needle casts one row of stitches.

The essential problem lies in determining the movement of the needles from the extreme bottom to the extreme upper position. And since the needles move according to a sinusoidal law relative to the uniform rotation of the head, the question relates to determining the amplitude of the harmonic oscillatory motion.

The harmonic function of the axial cam has one argument - the angular position α of the head along the axis of rotation and one parameter - the movement of the head along the axis of rotation and one parameter - the movement Δh of the needles. The axial cam equation consists of 2 terms:

$$\begin{cases} h = \Delta h(1 + \sin \alpha) \\ 2.\Delta h = H_{max} - h_{min} \end{cases}$$



Functional walls from the heel of the knitting needle are in constant contact with the guide surface from the profile of the axial cam. These walls are perpendicular to the vertical movement of the needle and therefore the leading surface of the axial cam must be parallel to the normal from the local coordinate system.

With the conditions for the cam function and the zero slope of the guide profile, the spatial model for making the axial cam is ready. It remains to measure and determine the numerical values of the model.

Subject of this article is the spatial model for making an axial cam from a knitting head for cords.

Purpose of the development consists in determining the numerical values of the guide profile with the additional condition that the movement of the knitting needles is carried out by the guide profiles of paired mirror axial cams.

Keywords: knitted cord, textile engineering, small knitting head, and axial cam.

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APPLICATION OF MODERN CARPENTRY TECHNOLOGIES FOR MAKING A HORIZONTAL HAND-OPERATED LOOM

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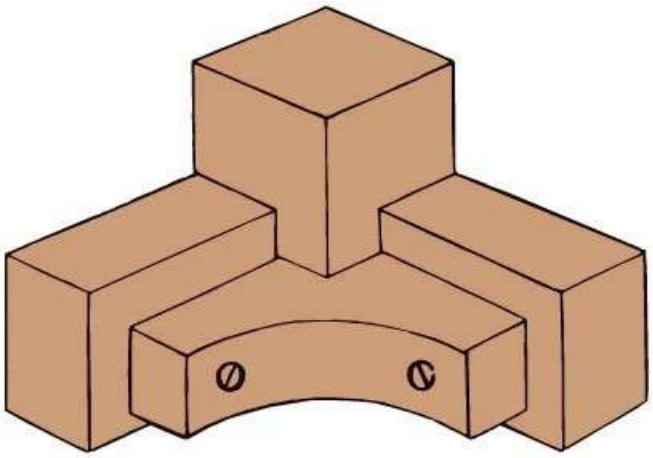
The successful application of hand weaving in modern times can only be achieved by combining modern engineering techniques with optimally selected materials and in-depth materials science in carpentry.

The basic principle for building a handloom follows the balance between durable construction, diverse weaving capabilities and overall ergonomics.

The essential problem consists in finding an optimal combination between the carpentry materials and the assemblies of the working bodies.

The conceptual design of the loom is based on the modularly upgraded functional groups and capabilities of the loom.

Heavy woods with a high relative density and strength are used to make the chassis. They provide stability in operation and longevity of the loom.



Light woods are suitable for moving parts operated by the hand, such as the shuttle, for example.

The bearing assemblies of the moving parts such as the main and the traction cross ensure the durability of the loom and reduced human effort when driving.

The subject of this article is to identify and direct the design of the hand loom in the direction of the materials, the machine elements of the assemblies and the general construction.

The purpose of the development is a list of the necessary carpentry materials for the various working bodies.

In addition, it is necessary to distinguish the different types of assemblies (fixed and movable) and select the appropriate machine elements.

The collected and arranged technological information leads to optimal constructive solutions.

The tasks are mainly related to the research and collection of technical data on the construction materials within the framework of the conceptual design and the applicable techniques for making and assembling the loom.

Keywords: weaving, hand looms, carpentry technology

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DESIGN TRENDS OF WEAVING TECHNIQUES IN THE FRAMES OF INTERNET OF THINGS AND SUSTAINABILITY RESTRICTIONS

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Starting the design of a new weaving loom, constructors have to do better than just a few picks faster than the previous generation. Today's world is all about connectivity, user-centric design, intuitive controls, self-learning capacities and sustainability. Four key principles serve as the starting point for the design of any perspective-weaving machine.

Smart Performance is the first requirement for any machine or feature, and the obvious indicator is the theoretical maximum speed. However, the gap between this theoretical speed and the effective speed under real-life conditions is huge. Increasing real performance also means reducing downtime to an absolute minimum. For example with *Quick Style Change*, the quickest way to get new styles up and running. Smart technology also monitors the behaviour of the yarn and the weaving process on a permanent basis. It is possible by constantly tweaking the insertion parameters using sophisticated algorithms. Smart Performance is an intelligent machine design combined with self-setting software, allowing the highest possible practical speed and best performance under real conditions.

Sustainability Inside prevents waste and reduces energy consumption; machines design has long faced up to its responsibility. Pioneering *Sumo Drive*, introduced back in 1996, has demonstrated this and it is still the most energy-efficient main drive available. *EcoFill* device reduces the waste and tries to void it completely. Breakthrough developments such as the *Blue22* generation of pre-winders make it possible to minimize the waste length even while the machine is running.

Driven by Data allows the transition of the technology parameters towards database. Data capturing conditions artificial intelligence application and the manufacturing becomes more efficient. Applications such as *ARVD II Plus, AirMaster and OptiSpeed* are becoming possible for monitoring, automatic adjustment and remote troubleshooting, to the further deploying of Industry 4.0 in the weaving industry.

Intuitive Control on the weaving machine display is the interface that controls nearly all the machine functions. Wireless-ready, robust and designed for instant readability. This user-centric approach is also embedded in the design of the overall machine, making all operations easy, intuitive and self-explanatory**.**

Subject of this article is the short presentation of sustainable trends in the weaving machines applicable in the next five years.

The purpose of the descriptive development is to acquaint the general audience with the diverse achievements and strategic goals in the textile engineering of weaving machines.

Keywords: textile engineering, weaving machines, IoT/AI, sustainable machinery

Topic № 6
TEXTILE MANAGEMENT, MARKETING AND SUSTAINABILITY

33
Economics.
Economic sciences.

Plenary lecture by Assoc. Prof. Desislava Staneva from UCTM - Sofia

Presentation by Eng. Ina Anastasova, PhD student in IP - BAS, Sofia,
Session Chair - Prof. Ivo Grabchev from Sofia University

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APPLICATION OF THE CHAIN OF CUSTODY IN THE TRANSFER OF WOOLEN RAW MATERIALS IN B2B TRANSACTIONS

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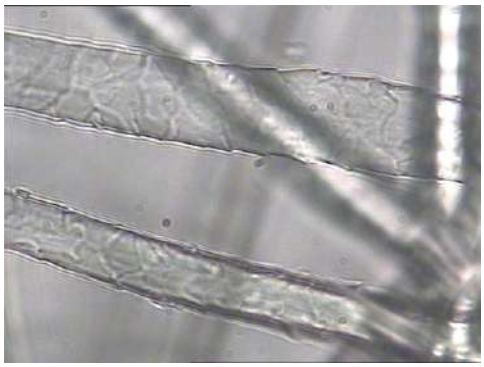
The certification process of wool fibrous raw materials and semi-finished products includes more and more standards and recommendations.

In the last 10 years, the main product standards of GOTS and the Textile Exchange - RWS (RAF) have been added to the Wool mark, WTO or British Wool regulations.

The core of these standards, which proves their practical application, is the Chain of Custody (CoC), as a general concept for the traceability system and the volume reconciliation of the transported materials.

In the spinning and weaving manufacturing of woollen materials, the fibrous raw are mixed and the mass balance model with the credit method of calculation is usually used.

The accuracy of the credit method is based on the announced system of equations, which aims at volume reconciliation between the supplier's output and the buyer's input in the successive transitions:



$$(1)\quad \begin{vmatrix} C_b = C_{bp} + (M_{in} * C_f) - M_o \\ C_b = C_{bp} + M_{in} - (M_o / C_f) \end{vmatrix}$$

The principle of the credit method equalizes the weight of the output Mo with the weight of the input Mi through the correction of the conversion factor or randomness. The essential problem in the application of the mathematical apparatus consists in the missing strict definition of the weights.

In the general case, volume reconciliation is based on the specific methodologies allowed by the standards for each organization and the use of standardized weights. As far as the development of different calculation techniques is acceptable, there is no notion of standardized weight. The standard concepts of gross, net and condition weight are known.

Typically, and for convenience in transactions, net weight is applied, which is a function of the environment and varies. The discrepancy between the strict idea of the credit mass balance and the variety of mathematical expressions of net weight deprives the chain of custody of an objective mutually recognized basis. In essence, CoC, volume reconciliation and mass balance are interrelated forms of non-financial accounting.

The subject of this article is the mathematical apparatus of the credit mass balance of CoC for Woolen Materials. The goal is to develop a method for determining volume reconciliation and with available computer programs to find application in the daily certification process.

Keywords: textiles, product standards, CoC, mass balance

https://doi.org/10.53230/tgm.1310-912X.2023.0010.36

EFFECTIVE ORGANIZATION OF HANDWEAVING FOR MASS PRODUCTION

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Machine production of mass fabrics has sufficient capacity to over satisfy the world market.

The small and insignificant weakness of the factory organization consists in the maximum uniformity of the fabrics and the reduction of efficiency with the diversification of the assortment.

The essential disadvantage of industrial fabrics and textile products, in general, is the lack of individuality, even at the cost of the main quality compromise - unevenness.

Diametrically opposite is hand weaving: personal presence in the product, maximum variety and low productivity with acceptable quality.

Three interrelated factors affect the efficiency of hand weaving: the weaving equipment, the complexity of the fabric and the ergonomics of the loom.

Without weaving equipment from the obligatory auxiliary manual devices: warping frames, shuttles and bobbin winders, weaving practically cannot exist.

Fabric complexity, such as variety and colour patterns, has a predictable effect on performance. A complex contexture usually balances performance with the uniqueness of the product.

The essence of efficiency is based on the ergonomics of the handloom as a condition of the interaction between the weaver and the loom.

The ergonomics of the loom is a combination of technological possibilities and convenience for service and work. The optimal solution as a construction and assembling of the handloom should enable the execution of original fabrics with the maximum duration of a hand weaving session.

The present study is descriptive in nature. It is focussing on the transition between manufacturing and factory production.

Subject of this paper is the combined influence of auxiliary equipment, contexture and loom ergonomics on the efficiency of hand weaving.

The purpose of the development is to quantify the influence of each of the factors, and primarily – the weaver's modus operandi with the handloom.

Keywords: hand weaving, ergonomics, weaving productivity

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SOCIAL POLICIES IN PRODUCT STANDARDS FOR TEXTILE AND SEWING PRODUCTION

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Textile and sewing production support the largest labour resources compared to other industries. The main reason is due to the individual use of textiles and the anthropomorphic principle of spinning of the yarns and weaving of the fabrics. People want to dress differently from others and that their clothing radiates individual traits: modesty or expressiveness, modernity or tradition.

Despite the enormous evolution of textile technics, spinning, weaving and sewing necessarily require direct interaction between machine and man. The large collectives combined with the three-shift, continuous mode of production give rise to complex social and labour relations that define the environment in the textile industry. Supply chains, technological flows and the textile market are not only international but now transcontinental. This trend of globalization will develop and thus confirm the principle that textile is a collective work.

Except for textile farms and enterprises, there are generally sufficient normative documents that regulate socially fair labour conditions. The most comprehensive are the 10 principles of the UN Global Compact for Human Rights and Fair Work. The social group of the 17 goals of sustainable development has local European significance.

Two standards are of practical importance: SA 8000 for socially fair labour conditions and ISO 45001 for safe and healthy labour conditions. These standards are mandatory implemented in enterprises. For their application, the organization / enterprise provides the necessary resources: personnel and material. These standards form an independent direction in the management of corporate activity.

At the same time, a large number of product standards: GOTS, GRS, Better Cotton, etc., have entire chapters and clauses dedicated to the social policy in enterprises. To a large extent, the social requirements in the product standards are the same or similar to the texts in the basic social standards. Instead of focusing on the chain of custody and technology side of sustainability, some product standards overlap with social ones and divert management resources.

Subject of the article is the matching of the socially oriented texts in the standards with production application in the textile and sewing industry.

The purpose of development is to identify redundant duplications and propose them to certification bodies for removal.

Keywords: textiles, product standards, social requirements

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Topic № 7
INNOVATIONS IN TEXTILE EDUCATION

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Special Education.
Vocational education.
Vocational schools.

Presentation by Eng. Maria Koleva, PhD student at SWU Neofit Rilski,
Session Chair - Assoc. Prof. Maria Spasova from IP - BAS, Sofia

Presentation by Maria-Anna Grigorova from PGO Princess Maria Luisa - Sofia,
Session Assistant - Victoria Stoyanova from PGO Princess Maria Luisa - Sofia

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TISSAGE D'ART & FORMATIONS en Nouvelle-Aquitaine

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En tant que tisserande formatrice et artiste textile depuis 40 ans, j'ai accumulé une expérience précieuse et une expertise approfondie dans mon domaine. J'ai commencé mon parcours dans un environnement associatif, en bénéficiant de stages réguliers qui m'ont permis d'acquérir des compétences essentielles. Au fil du temps, j'ai également poursuivi ma formation de manière autonome en m'appuyant sur des livres et des magazines techniques spécialisés ainsi que sur les conseils d'autres professionnels du tissage. Au cours des 20 dernières années, j'ai exercé de manière indépendante mon activité d'artiste textile et formatrice. En tant qu'artiste, j'ai développé un style unique mélangeant des techniques de tissage et de tapisserie dans mes créations. Ma créativité et ma sensibilité artistique m'ont permis de concevoir des pièces uniques et d'exprimer ma vision artistique à travers le tissage et les textiles. En tant que formatrice, j'ai développé une solide pédagogie pour transmettre non seulement les techniques de base du tissage, mais aussi les astuces, les nuances et les subtilités qui font toute la différence dans la création textile. J'ai accompagné de nombreux étudiants et tisserands débutants, en les aidant à maîtriser les rudiments du métier et les approfondissements, tout en les encourageant à développer leur propre style et leur créativité. Mon rôle de formatrice a modestement contribué à enrichir et à faire croître la communauté du tissage. En tant qu'acteur de longue date de la communauté artistique textile j'espère continuer à inspirer et à éduquer les générations actuelles et futures de tisserandes et de tisserands.

En ce qui concerne mon atelier, j'exerce mes activités de création et d'enseignement au sein d'un atelier personnel professionnel, situé dans le bourg médiéval d'un village remarquable. Je dispose de cinq métiers à tisser différents de 4 à 24 cadres, système à la lève à pédales et à manettes. Ces métiers servent à ma production et aux stagiaires. Les stagiaires sont plongées dans un milieu professionnel actif ce qui représente un avantage certain sur les établissements d'enseignement collectif. Le tissage à la main englobe toutes les productions tissées qui sont exécutées sur différents métiers à tisser opérés sans motorisation. Cela comprend les métiers à manettes, à pédales, à mécaniques d'armures, mécaniques Jacquard manuelles ou électroniques et d'autres matériels plus anecdotiques. Quant au tissage d'art, il recouvre principalement des pièces d'art mural, de tentures, de sculptures textiles mais aussi des pièces uniques utilitaires.

Keywords: textile craft, hand weaving, training

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CONSTRUCTION OF A DATABASE FOR THE STORAGE AND REPRODUCTION OF HOUSEHOLD WOVEN FABRICS

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For centuries, the constant clothing needs of Bulgarians have been met by making yarns and woven fabrics in domestic, family settings. Now, even with the mighty onslaught of managed fashion trends and the over-productive textile industry, the preserved ethnographic collections impress with the variety and style of clothing and fabrics. The strongest point of textile household products is their bright individualism, reaching artistic suggestion. The essential importance of the wealth of patterns, fabrics and combinations is based on the invested personal abilities and sense of the Bulgarian family in the limited access to fibrous raw materials, dyes and techniques.

Technical data on the construction, pattern and fibrous composition of the woven fabric is derived through the methods of metrology analysis. The generalized algorithm of the analysis starts with the external indicators such as width and area mass of the fabric. The next step concerns determining the densities of the warp and weft threads, together with the weave as a row and method of interlacement. The third step of the analysis is focused on yarn construction such as fibrous composition, linear density, spinning twists, etc. Finally, the fabric analysis concludes with an evaluation of the colours and their combinations.

$$\Lambda_{ij} = \begin{Bmatrix} a_{ij} & b_{ij} & c_{ij} \\ a_{ij} & b_{ij} & c_{ij} \\ a_{ij} & b_{ij} & c_{ij} \end{Bmatrix}$$

All data from the analysis are numerical values of qualitative indicators, obtained in an objective way with metrological equipment. The essential issue of converting heterogeneous numerical data from laboratory analysis into a database requires the development of a relatively universal matrix of the second or third range with a uniform arrangement of indicators. The specific nature and the general heterogeneity of the quality indicators of textile materials require the compilation and use of a matrix with a common scheme of construction and equally applicable to woven fabrics.

The subject of the article is a matrix with elements of the numerical values of the quality indicators of woven fabrics with an application in a prospective DBMS.

The purpose of the development at this stage is to determine the quantitative indicators that will make up the matrix of a woven fabric, along with the format and arrangement of the elements in columns and rows.

The ultimate goal is to compile a dynamic digital catalogue with a database of authentic Bulgarian woven fabrics.

Keywords: home woven fabrics, technical specifications, database

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Presentation by Eng. Tashka Koleva, PhD student at SWU Neophyt Rilski

Social program of foreign lecturers: Prof. VU Thi Hong Khanh from Vietnam,
Mme Sylvie Boyer from France and Prof. Saber Ben Abdessalem from Tunisia.

XXV национална текстилна конференция „Традиции и иновации в текстила и облеклото“

В периода 26 – 28 октомври 2023 година в Университетския център „Бачиново“ на ЮЗУ „Неофит Рилски“ се проведе XXV национална конференция с международно участие „Традиции и иновации в текстила и облеклото“. Форумът се организира ежегодно от Научно-техническия съюз по текстил, облекло и кожи със сътрудничеството на катедрите по текстил и дизайн във висшите училища в България.

Домакин на събитието тази година беше катедра „Машинно инженерство“, водеща обучение по специалност „Дизайн и технологии за облекло и текстил“ в Техническия факултет на ЮЗУ „Неофит Рилски“.

В научния форум, който се проведе хибридно, взеха участие над 100 студенти, докторанти, специалисти, преподаватели и учени от висши училища у нас и в чужбина, от професионалните гимназии по дизайн, текстил и облекло, от Института по полимери на БАН, Института по отбрана „Проф. Цветан Лазаров“, от висши училища във Франция, Виетнам, Македония, Турция, Тунис, Германия, Белгия. Онлайн се включиха студенти, докторанти и учени от Ханойския университет по наука и технологии, Университет „Св. св. Кирил и Методий“ в Скопие, Техническият университет в Дрезден, Школата по художествено тъкане в град Пен д'Ажене, Франция и други.

Конференцията беше открита от декана на Техническия факултет проф. д-р инж. Снежина Андонова. В приветственото си слово тя подчерта, че за целия преподавателски колегиум на факултета е чест и удоволствие за поредна година да работят в екип с Научно-техническия съюз по текстил, облекло и кожи.

Научното събитие се провежда и с подкрепата на Фонд „Научни изследвания“ в резултат на спечелен проект под ръководството на председателя на Научно-техническия съюз по текстил, облекло и кожи доц. д-р Ивелин Рахнев. Той подчерта значимостта на този традиционен научен форум за всички специалисти в областта на дизайна, текстила и облеклото у нас и благодари на спонсорите на конференцията „Е. Миролио“ ЕАД – Сливен, „Пиринтекс“ ЕООД – Гоце Делчев, „Лемприер Уул“ ЕООД – Сливен, Picanol HB – Белгия, както и на домакините на събитието.

Работата на конференцията започна с кръгла маса на тема „Кадрово осигуряване на текстилната професия“. Основни тематични изказвания бяха направени от инж. Фани Тодорова – главен експерт в дирекция „Професионално образование и обучение“ към Министерството на образованието и науката и Красимир Вълчев – зам. Председател на Федерацията на независимите синдикални организации от леката промишленост.

В научните сесии бяха представени доклади, свързани с новите влакнести суровини (нанотехнологии в текстила); антимикробни текстили и други иновационни технологии в текстилното и шевно производство; съвременното текстилно изкуство, модата, композицията; управлението, маркетинга и устойчивото развитие в съвременното шевно и текстилно производство, както и актуални методи и форми на обучение в областта на текстила и облеклото.

В рамките на конференцията беше представено модно ревю, организирано от специалност „Мода“ към Факултета по изкуствата в Югозападния университет. Ревюто се откри с колекция „Еко“ от рециклиран деним на студентите от специалност „Мода“ в Югозападния университет Милица Стайковска, Жаклин Вълчкова, Йоана Мирчева, Йорданка Тодорова, Ралица Витанова, Таня Велева, Стефи Ангелова и Мария Георгиева. Представена беше и колекцията „Цунами“ на Вергиня Никлева – дипломант от срециалност „Мода“ към Югозападен университет. Студентските колекции са реализирани с подкрепата на преподавателите гл. ас. д-р Татяна Христова, гл. ас. д-р Милка Александрова, гл. ас. д-р Росица Рангелова и старши преподавател Мария Онтева.

В ревюто бяха представени и колекциите „Малка черна рокля“ и „Елегантност в ежедневието“ на студентите от специалност „Дизайн и технологии за облекло и текстил“ в Югозападния университет Милена Перчинкова и Юлияна Димитрова, реализирани под ръководството на ас. Умме Капанък.

В ревюто взеха участие и студенти от специалност „Моден дизайн“ в Национална художествена академия – София под ръководството на проф. Мая Богданова; ученици от специалност „Производство на облекло от текстил“ от Иновативно средно училище „Методи Драгинов“ – с. Драгиново, община Велинград под ръководството на инж. Елка Джуракова, както и завършили специалност „Сценичен костюм“ и „Конструиране и моделиране на облекло от текстил“ в Професионална гимназия по облекло “Княгиня Мария Луиза“ – София под ръководството на маг. инж. Мария Колева.

Сред гостите на церемонията по откриване на конференцията бяха Мария Димова – областен управител на област с административен център Благоевград , Мария Петрова – заместник-кмет на община Благоевград, проф. д-р Емил Куков – ръководител на катедра „Изобразително изкуство“ към ЮЗУ „Неофит Рилски“, преподаватели, специалисти, учени, студенти и докторанти от висши училища и професионални гимназии, в които се води обучение по дизайн, облекло и текстил.

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