BOOK OF ABSTRACTS

14th Joint International Conference Clotech2022

on

Innovative Materials, Technologies and Testing Techniques for Clothing Improvement

Honorary Patronage of:

- **Mayor of Gdynia Wojciech Szczurek**
- **His Magnificence, Rector of Lodz University of Technology, Prof. Krzysztof Jóźwik**
- **Dean of the Faculty of Material Technologies and Textile Design, Prof. Katarzyna Grabowska**

Honorary Patronag MAYOR OF GDYNIA Wojciech Szczurek

Lodz University of Technology

Honorary Patronage RECTOR OF LODZ UNIVERSITY OF TECHNOLOGY

Lodz University of Technology WTMiWT

Honorary Patronage DEAN OF THE FACULTY OF MATERIAL TECHNOLOGIES AND TEXTILE DESIGN

September 5th-8th, 2022 Gdynia

Organized by :

Gdynia Cotton Association	
Lodz University of Technology **Institute of Textile Architecture** **Department of Clothing Technology and Textronics**	
Technische Universität Dresden	
Kazimierz Pulaski University of Technology and Humanities in Radom	

Scientific Editors:

Grażyna Bartkowiak, Iwona Frydrych, Yordan Kyosev,

Sybille Krzywinski, Maria Pawłowa

Edited by: Agnieszka Cichocka

ISBN 978-83-66741-64-5

GOLDEN SPONSORS OF CLOTECH2022

monnari

Łukasiewicz
Łódź Institute of Technology

ZWOLTEX
SINCE 1946

POLSKA
FABRYKA
RĘCZNIKÓW

SPONSORS OF CLOTECH2022

cotton house
JAKUBIAK sp.j.

dywilan®

BILIŃSKI
Factory Of Colour

SCIENTIFIC COMMITTEE

Chairpersons:

- Grażyna Bartkowiak, Central Institute of Labour Protection – National Research Institute, Poland,
- Iwona Frydrych, Lodz University of Technology, Poland
- Yordan Kyosev & Sybille Krzywinski, Institute of Textile Machinery and HighPerformance Material Technology, TU Dresden, Germany,
- Maria Pawłowa, Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland

Members of Scientific Committee:

- Arun Aneja,, Department of Engineering, East Carolina University, Greenville, USA
- Serhiy Bereznenko, Kyiv National University of Technologies and Design, Kyiv, Ukraine
- Pascal Bruniaux, ENSAIT, Roubaix, France
- Agnieszka Cichocka, Lodz University of Technology, Poland
- Anna Dąbrowska, Central Institute of Labour Protection – National Research Institute, Poland
- Katarzyna Grabowska, Lodz University of Technology, Poland
- Antonin Havelka, Technical University of Liberec, Czech Republic
- Lubos Hes, Technical University of Liberec, Czech Republic
- Paul Kiekens, professor emeritus of Ghent University, Belgium
- Marcin Kostrzewa, Kazimierz Pulaski University of Technology and Humanities in Radom, Poland
- Dana Kremenakova, Technical University of Liberec, Czech Republic
- Malgorzata Matusiak, Lodz University of Technology, Poland
- Rimvydas Milasius, Kaunas University of Technology, Lithuania
- Jiri Militky, Technical University of Liberec, Czech Republic
- Olga Paraska, Khmelnytskyi National University, Ukraine
- Roshan Paul, Institut für Textiltechnik of RWTH Aachen University, Germany
- Rene Rossi, EMPA, Switzerland
- Andreja Rudolf, University of Maribor, Slovenia
- Ajoy Sarkar, State University of New York, School of Business and Technology, Textile Development and Marketing, USA
- Zbigniew Stempień, Lodz University of Technology, Poland
- Eugenija Strazdiene, Vilnius University of Applied Sciences, Lithuania
- George K Stylios, Research Institute for Flexible Materials (RIFleX), Great Britain
- Malgorzata Zimniewska, Institute of Natural Fibers and Herbal Plants, Poznan, Poland

ORGANIZING COMMITTEE

- Agnieszka Cichocka, Lodz University of Technology, Institute of Textile Architecture,
- Iwona Frydrych, President of the Gdynia Cotton Association, Lodz University of Technology, Institute of Textile Architecture,
- Jerzy Kotwas, Gdynia Cotton Association
- Yordan Kyosev, The Institute of Textile Machinery and High Performance (ITM) – Technical University in Dresden,
- Pamela Miśkiewicz, Lodz University of Technology, Institute of Textile Architecture,
- Halina Szafrańska, Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland, Faculty of Chemical Engineering and Commodity Science Material,
- Katarzyna Święcicka, Executive Vice President of the Gdynia Cotton Association,
- Secretariat: Justyna Pinkos – Lodz University of Technology, Institute of Textile Architecture, e-mail:

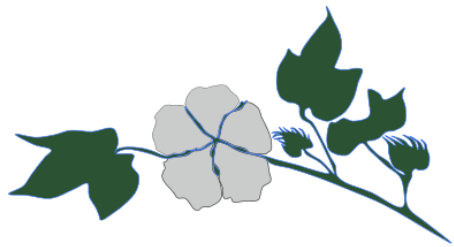
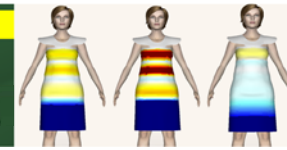


TABLE OF CONTENTS

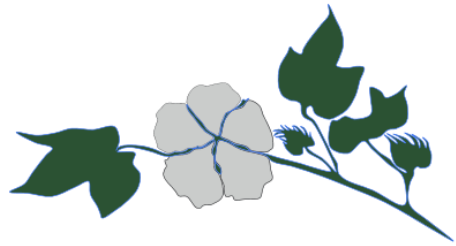
CLOTHING TECHNOLOGY (FIT)

SUSTANABLITY & FASHION

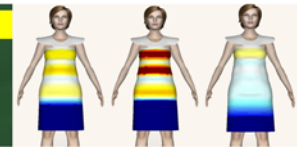
14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



INITIAL PAPER



14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



COMPARATIVE STUDY OF SINGLE COTTON FIBERS FOR FORENSIC PURPOSES

Jolanta Wąs-Gubała

Institute of Forensic Research, Krakow, Poland

Contact person: jwas@ies.gov.pl

Description:

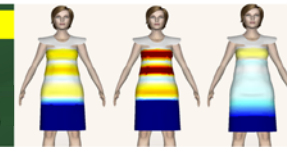
Forensic microtraces in the form of fragments of single cotton fibres are secured in cases of various types of criminal events, such as homicides, sexual abuses, road accidents or assaults and robberies. Very often, comparative examinations of cotton fibres revealed at the scene of the crime, on the victim's clothing or, for example, under the victim fingernails, with the cotton fibres present in the composition of clothing, e.g. belonging to the suspect, are carried out for establishing the relationship between people involved in such events. In the case of comparative examinations of cotton fibres, their colour is one of the most important physicochemical feature verified in the forensic study. Initially, fibres colour is compared with the use of non-destructive optical microscopy techniques, i.e. bright-field microscopy, followed by fluorescence microscopy, where various filters for epifluorescence imaging are used. Then, visible and UV microspectrophotometry should be used as an objective method available in forensic laboratories to differentiate the coloured fragments of single cotton fibres.

In order to compare the chemical composition of dyes enclosed in the cotton fibres, the Raman microspectrometry method can be applied due to its nondestructive nature. However, among the destructive methods, i.e. requiring the extraction of dyes from cotton fibres, the promising results have been obtained using thin layer chromatography, and recently liquid chromatography and capillary electrophoresis.

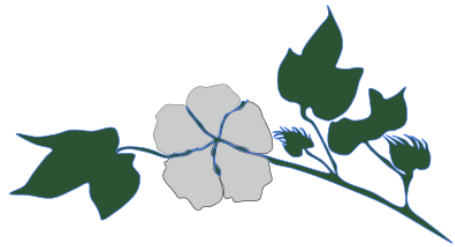
Due to the mass production of textiles, it is not possible to carry out the so-called individual identification, i.e. an indication that the examined microtraces come from a specific manufactured article. In the conclusions of the opinion, the expert most often indicates the compatibility of the features of the compared fibres or evaluates, whether the microtraces may come from an article being secured as comparative material. However, this conclusion can be strengthened taking into account the abundance of cotton textiles of a certain colour on the consumer market, as well as the degree of dissemination of fragments of coloured cotton fibres in the environment, assessed on the basis of the results of the so-called fibre population studies.

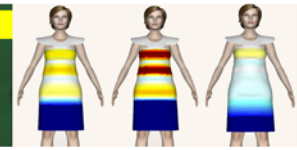
These issues will be discussed during the presentation, and additionally, their practical aspect will be presented.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



SPECIALIZED CLOTHING





INFLUENCE OF POLYESTER FABRIC WITH INFRARED EMISSIVE ADDITIVES ON CELL METABOLISM

Peng Fei He, Veerakumar Arumugam, Aleksander Gora, Vitali Lipik

School of Material Science and Engineering, Nanyang Technological University, Singapore

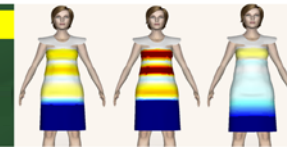
Contact person: vitali@ntu.edu.sg

Description:

Functional apparel with beneficial influence on human body would be desirable product on the market. Fabrics with effects of vasodilation, influencing metabolism and energy supplying are of great interest and may extensively applied in wellness and sport apparel. In this work, we fabricated fabrics incorporated with two different compounds and their mixture, and investigated their biological effects in human skeletal muscle cells. Additives – silicon oxide doped with 10% of iron oxide III or graphene - possessed high property for infrared emission. Additives were firstly compounded with polyester pellets in extruder compounder followed by spinning of 75 denier 48 filaments yarn. Yarn was used for the manufacturing of single jersey knitted fabric with density 150 g/m^2. Amount of additives in fabric varied from 2 to 4 wt%.

Infrared emissivity of polyester fabric with additives in the range 5-20 μm increased from 0.909 to 0.988 compared with reference fabric. Emission of IR energy in the range 4-16 um from fabric surface augmented by 6% in average and by 9% in the area of 8-12 μm which corresponds to the range of peak IR emission from human body. Interestingly the amount of infrared emissivity is not positively correlated to the concentration of additives in the fabric.

In the cell study, we co-cultured the fabric with human skeletal muscle cells to study the influence on the nitric oxide (NO) generation, a key signal molecule that involved in certain physiological pathways. We found the addition of emissive components to the fabric lead to 20%-40% increase of nitrite - levels in muscle cells after 24 hours of exposure. Highest increase was observed in the graphene-containing additives. As a physiological storage pool of NO, nitrite could be converted into NO and subsequently activate certain pathways, leading to the effects of vasodilation or increasing energy expenditure. Furthermore, the increase of NO was not caused by inflammation, as the amount inducible nitric oxide synthase (iNOS) was not significantly increased. The production of NO may be possibly via activation of ion channels on the cell membrane.

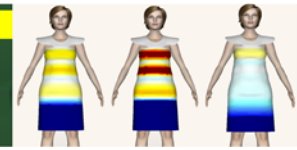


Besides, we found the additives may increase mitochondrial biogenesis, as proved by the increase of mitochondrial copy number.

The mitochondrial biogenesis may be a possible pathway activated by nitric oxide and potentially accelerate energy expenditure, producing more energy for use.

The observations in the cell study indicate the potential biological effects of the fabric with additives. The apparel derived from the fabric may potentially have the physiological effects such as vasodilation, increasing blood flow and influence metabolism, making them good candidate for the application in the sports performance and recovery, as well as body composition management.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



TESTING FOR LONGEVITY IN SPORTS CLOTHING

Lars Claussen[1], Alex Lloyd[1], Daniel Ruizb[2], George Havenith[1]

[1]Environmental Ergonomics Research Centre, Loughborough School of Design and Creative Arts, Loughborough University, Loughborough, UK;
[2]Adidas AG, Herzogenaurach, Germany

Contact person: g.havenith@lboro.ac.uk

Description:

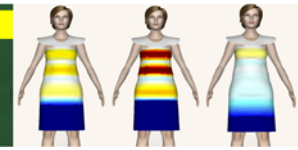
Extending the longevity of sports clothing is one of the recommended strategies in the context of the sports clothing industries transformation towards sustainability and circular economy. However, currently no standardized test protocol exist that allows the assessment of clothing longevity. The demands regarding the clothing's long-term quality are further dependent on the use case.

This study aimed to establish an initial test protocol for longevity in sports clothing based on existing test methods. A use length of one and two years were simulated by repeated washes of sports t-shirts. The properties of the t-shirts were characterized before and after the different wash cycles.

Due to sports clothing's functional nature not only conventional textile characteristics like snagging were tested but also characteristics related to the physiological and tactile comfort.

The study results showed how sports t-shirts characteristics change by extended washing, what characteristics were critical for longevity testing and how a test protocol needs to be adapted for the special nature of sports clothing.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



CONSUMERS' KNOWLEDGE AND ACCEPTANCE OF SMART CLOTHING

Andreja Rudolf, Zoran Stjepanovič, Monika Kuharič

University of Maribor, Faculty of Mechanical Engineering, Institute of Engineering Materials and Design, Slovenia

Contact person: andreja.rudolf@um.si

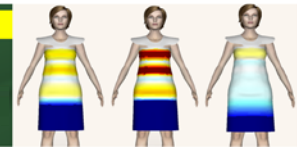
Description:

To help innovative products breakthrough in the marketplace, it is necessary to gain consumer trust. However, consumers do not necessarily receive innovations positively and may have a number of concerns about them. Innovation involves change, and many consumers are reluctant to change or need more time to gain confidence in an innovative product, whether in terms of its usefulness, benefits, price, appearance, etc.

Therefore, consumers' lack of knowledge and acceptance of innovation may be one of the key reasons why many innovations fail to come to life in the market. Smart clothing, as a kind of wearable device that combines information and communication technologies and textile materials in a clothing system, has great potential for development and market breakthrough today. In this study, we investigated the prevalence of smart wearable devices and smart clothing in terms of consumers' knowledge and acceptance of smart clothing by consumers.

The results of the survey serve as a guide for the development of the most desirable smart clothing on the one hand and indicate the necessary communication strategies for its breakthrough in the market on the other.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



CLOTHING NEEDS OF ADULTS WITH DOWN SYNDROME

Małgorzata Matusiak, Nina Kuryłło

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles

Contact person: malgorzata.matusiak@p.lodz.pl

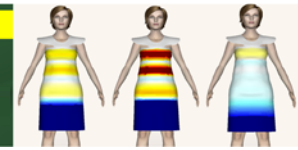
Description:

It is very difficult to find on the market ot find any clothes made specifically for people with Down syndrome.

Especially, in the case of adults with Down syndrome it is a huge problem with clothing that suit their body shape as well as being stylish. The aim of this work was to analyze the needs of adults with Down syndrome in the field of clothing, and propose some useful guidelines for clothing designers.

The aim was achieved by interviewing the caregivers of adults with Down syndrome and anthropometric analysis of exemplary profiles of women with Down syndrome.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



DESIGNING OF CASUAL WEAR FOR WHEELCHAIR USERS

Nataliya Sadretdinova[1], Sergii Bereznenko[1], Larysa Bilotska[1], Halina Szafrańska[2], Maria Pawlowa[2]

[1]Kyiv National University of Technologies and Design, Kyiv, Ukraine,
[2]Kazimierz Pulaski University of Technology and Humanities in Radom, Radom, Poland

Contact person: sadretdinova.nv@knutd.com.ua

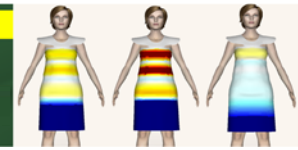
Description:

Functionality and comfort are important requirements for adaptive clothing. To ensure the compliance of clothing with these requirements, it is necessary to take into account, on the one hand, consumer conditions, on the other - specific needs driven from social and psychophysiological adaptation to the living conditions.

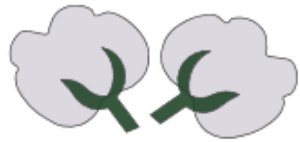
Thus, for people who are restricted to the sitting position for their entire life due to their disabilities, it is important to avoid skin diseases that occur in conditions of constant contact of the skin with hard surfaces under pressure.

Therefore, the aim of our work was to improve functional clothing for disabled people based on the analysis of ergonomics and consumer requirements through the application of new technologies.

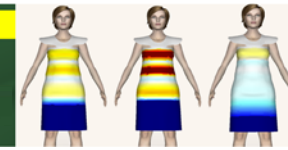
14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



PROTECTIVE CLOTHING



14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



AN INNOVATIVE THERMAL PROTECTIVE CLOTHING SYSTEM FOR FIREFIGHTERS

G. Santos[1], R. Marques[1], F. Marques[2], J. Ribeiro[2], A. Fonseca[3], J.M. Miranda[3], J.B.L.M. Campos[3], S.F. Neves[3]

[1]CITEVE - Technological Centre for the Textile and Clothing Industries of Portugal, V. N. Famalicão, Portugal
[2]CeNTI - Centre for Nanotechnology and Smart Materials, V. N. Famalicão, Portugal
[3]CEFT - Transport Phenomena Research Center, Department of Chemical Engineering, Faculty of Engineering, University of Porto,s/n Rua Dr. Roberto Frias 4200-465 Porto, Portugal

Contact person: gsantos@citeve.pt

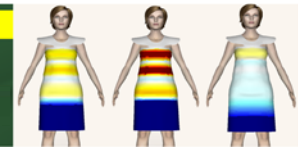
Description:

Nowadays, despite the evolution of personal protective equipment (PPE), the number of firefighters injured and burned during fire extinguishing operations is still very high, leading in some cases to loss of life. Therefore, the research and development of new solutions to minimize firefighter's heat load and skin burns, with consecutive improvements of commercial firefighter's suits, is of extreme importance.

DIF-Jacket project emerges to develop an innovative firefighter jacket, combining available solutions and techniques to produce a Thermal Protective Clothing with outstanding performance, by following a procedure based on the application of numerical models to optimize the design (https://difjacketproject.fe.up.pt/). One of the studied solutions consists in the integration of phase change materials (PCM) in a protective clothing system to significantly reduce the incoming heat flux from the fire environment. The protective clothing system under development is composed by a vest, specially designed to protect the torso (back, chest and abdomen) with a layer of PCM pouches, to be worn over a fire-resistant jacket - selection and design based on numerical models' predictions.

To integrate PCM pouches in the cooling vest different approaches were analyzed to achieve the best compromise between heat protection and comfort parameters, such as thermal and water-vapor resistances. The major challenge is to integrate the PCM pouches without compromising vest ergonomics and, simultaneous, accomplishing the requirements of the International Standard of protective clothing for firefighters – laboratory test methods, and performance requirements for wildland firefighting clothing.

Therefore, several mockups were made varying the number of PCM pouches and their distribution in the vest, allowing the creation of air ducts to increase the breathability of the vest. Accordingly with the guidelines for selection, use, care and maintenance of smart garments protecting against heat and flame, particularly with PCM packages, it is



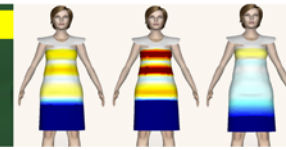
important to ensure that PCM pouches can be removed for clean and inspection purposes. This additional requirement was also studied during the integration process, analyzing the best ways to make the PCM pouches removable. In this study, several innovative manufacturing technologies and processes were used namely tailoring, lamination, laser cutting, adhesive bonding, and encapsulation. The most promising solutions are being evaluated in a real controlled environment, at a simulation site of the Portuguese National School of Firefighters (ENB), using a fire manikin and thermocouples to monitor vest temperature during heat and flame exposure, and consequently to verify PCMs influence in heat protection.

Results regarding the development of a PCM vest will be presented focusing on the integration of PCM pouches and the thermal performance of the most promising solutions when tested in real controlled environment.

Acknowledgements:

This work was financially supported by PCIF/SSO/0106/2018 - Project “Development of an innovative firefighter jacket”, funded by national funds through FCT/MCTES (PIDDAC).

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



TEXTILE BALLISTIC SHIELDS WITH EMBROIDERED STRUCTURE

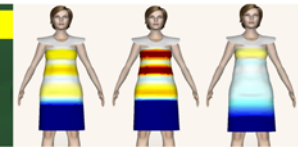
Maciej Gloger, Zbigniew Stempień, Justyna Pinkos

Lodz University of Technology, Institute of Textile Architecture,
Zeromskiego Street 116, Lodz, Poland,

Contact person: maciej.gloger@dokt.p.lodz.pl

Description:

Textile ballistic shields are the basis of protection against bullets fired from handguns and fragments with low energy of destruction. Usually they are made of para-aramid fabrics or unidirectional (UD) sheets of high-performance polyethylene (HPPE). Embroidered structures have so far not been considered layers of ballistic packages. The aim of the research presented in the presentation was the experimental analysis of the bullet resistance of ballistic packages composed of embroidered as well as hybrid structures composed of embroidered structures and fabrics after being hit by a 9 mm Parabellum bullet at a speed of 380 ± 3 m/s. The embroidered structures were made by embroidering two sets of para-aramid Twaron 930 dtex f1000 threads on the nonwoven substrate at an angle between them of 90°. As the woven structures, the use of Twaron CT 709 fabric made of the same yarn and with a surface weight comparable to that of embroidered structures was adopted. Ballistic packages consisted of 26 layers in five variants, also taking into account the hybrid arrangement of woven and embroidered layers. During the tests, the packages were clamped between two frames and the development of the deformation of the ballistic package during firing was recorded with the Cordin 550 (USA) high-speed recording camera. The conducted research has shown that the smallest deformation occurs in the hybrid package consisting of 13 layers of fabrics and 13 layers of embroidered structures. This deformation is significantly smaller compared to the packet consisting of 26 layers of fabrics. It can be concluded, that an embroidered structures are an interesting proposal in construction of ballistic packages limiting the trauma effects during of a ballistic stroke.



PROTECTIVE CLOTHING MATERIAL FOR POLICE FORCES - MOLOTOVCOCKTAIL PROTECTION

Rahel Krause, Justin Kühn, Thomas Gries

Institut für Textiltechnik (ITA) of RWTH Aachen University, Germany

Contact person: rahel.krause@ita.rwth-aachen.de

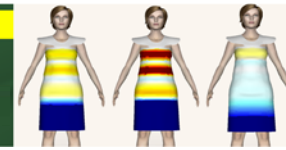
Description:

During Molotov cocktail attacks, temperatures up to 1700 °C are generated, resulting in heat shrinkage of the protective clothing (PPE). Shrinkage tightens the fit and reduces the insulating effect of the air layer between the body and the PPE.

In combination with the good thermal conductivity of m-aramid, it leads to faster heat transfer and thus to burns.

In order to minimize heat shrinkage, the approach is based on optimizing fiber compositions, fabric constructions and finishing of the PPE.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



POSSIBILITIES FOR QUALITATIVE EVALUATION OF THE PROTECTION AREA OF PROTECTIVE CLOTHING

Dominik Muenks, Yordan Kyosev, Jasmin Pilgrim, Caroline Koenig

Assembly Technology for Textile Products, Institute of Textile Machinery and High Performance Material Technology (ITM), Technical University of Dresden, Germany

Contact person: dominik.muenks@tu-dresden.de

Description:

Protective clothing, worn for example by police, ambulance and private security services, has the task of protecting against weapons attacks and is becoming increasingly important.

International standards specify test methods to ensure the protective effect and classes, but the protective surfaces or the wearing comfort are not defined in more detail in the norms.

The subject of this work is to provide an overview of the developments in this area and present first version of new methodology for the development of a measurement method using 3D/4D scanner technology, which will determine the protective surface and allow fit evaluations of protective clothing.

EVALUATION OF THE LONG-TERM PERFORMANCE OF A THERMOELECTRIC PERSONAL COOLING SYSTEM IN SIMULATED UTILITY CONDITIONS – A CASE STUDY

Anna Dąbrowska[1], Monika Kobus[1], Łukasz Starzak[2], Bartosz Pękosławski[2]

[1] Central Institute for Labour Protection National Research Institute, Department of Personal Protective Equipment,
[2] Lodz University of Technology, Department of Microelectronics and Computer Science, Poland

Contact person: andab@ciop.lodz.pl

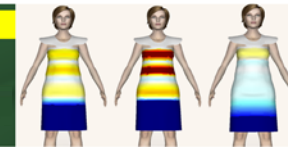
Description:

Thermoelectric modules can find a practical application in protective clothing with a cooling function. A personal cooling system using flexible thermoelectric modules integrated with clothing was developed and tested in simulated utility conditions.

The presentation will cover the evaluation of the performance of the personal cooling system during long-term use with various activities.

Moreover, the cooling efficiency of the thermoelectric module with the designed heat sink as measured on the "skin model" test stand will be also discussed.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



APPLICATION OF THE MAGNETRON SPUTTERING METHOD TO PRODUCE A COMPOSITE USED IN A HOT WORK ENVIRONMENT

Pamela Miśkiewicz[1], Iwona Frydrych[1], Agnieszka Cichocka[1], Marcin Makówka[2]

[1]Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland,
[2]Lodz University of Technology, Faculty of Mechanical Engineering, Institute of Materials Engineering,1/15 Stefanowskiego St., 90-924 Lodz, Poland Poland

Contact person: pamela.miskiewicz@p.lodz.pl

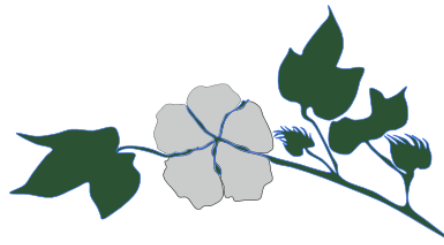
Description:

Composites based on a basalt fabric were produced as a result of the PVD process, intended for the use in a hot work environment. The composite consisted of the basalt fabric with a two-layer or composite coating, silicone and a Mylar® film, on which the same coatings were sprayed as on the basalt fabric. The produced composites differed from each other in the type of sprayed coating or the content of individual chemical compounds in the deposited coating.

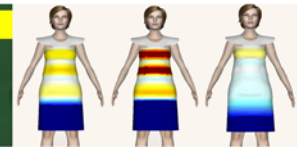
The magnetron sputtering method was used to deposit selected coatings on the surface of the basalt fabric and Mylar® film. It relies on spraying the material, which is the substrate of the produced coating with gas ions obtained in the area between the plasma and the charge. The atomized ions then pass through the plasma undergoing ionization or reactions containing ions and reactive gas atoms, leading to the deposition of a coating on the surface of the material.

The produced composites developed with the use of basalt fabric were tested for the resistance to contact heat for contact temperatures of 100 and 250°C and for resistance to thermal radiation.

POSTER SESSION



14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



ELECTRO-CONDUCTIVE WEFT-KNITTED STRUCTURES FOR HEAT GENERATION IN COMPRESSION SUPPORTS

Ginta Laureckienė, Md. Reazuddin Repon, Daiva Mikučionienė

Kaunas University of Technology, Faculty of Mechanical Engineering and Design, Department of Production Engineering, Lithuania

Contact person: ginta.laureckiene@ktu.lt

Description:

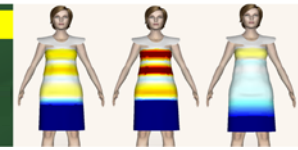
The aim was to develop compression knitted structures with integrated electro conductive yarns and to investigate their heat generation during the time. Six variants of specimens (with silver coated PA yarn of linear density of 66 tex and 235 tex as electro-conductive yarn) were developed by using different layout of electro-conductive yarns in a pattern repeat.

It was found that fabric structure and stretch during wearing highly influence temperature values of heated surface.

Acknowledgements:

This research was funded by the European Social Fund under the No 09.3.3-LMT-K-712 “Development of Competences of Scientists, other Researchers and Students through Practical Research Activities” measure.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



DEVELOPMENT OF PDMS/COPPER-COATED GRAPHITE ELASTOMER FOR STRAIN SENSORS APPLICATION

Yuanfeng Wang, Mohanapriya Venkataraman, Kai Yang, Qingyan Peng, Shi Hu, Jiri Militky

Department of Material Engineering, Faculty of Textile Engineering,
Technical University of Liberec, Czech Republic

Contact person: yuanfeng.wang@tul.cz

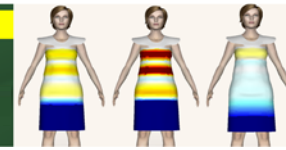
Description:

The rapid rise and unlimited potential of flexible electronics has led to the development of wearable devices and electronic skins becoming a research hotspot. Carbonaceous conductive polymers have received attention in the design of flexible strain sensors due to their excellent physical properties, such as enhanced mechanical properties and high electrical conductivity.

However, the most commonly used fillers in carbonaceous conducting polymer research, carbon nanotubes and graphene, are limited in their large-scale industrial application by high costs. In the present work, a facile metallization of the surface of graphite powder was implemented. Flexible conductive polymer composites were prepared subsequently by the modified graphite and polydimethylsiloxane (PDMS). The resistivity and strain sensor behaviour of the resulting modified graphite and composites were examined. The prepared strain sensors showed excellent stability and high durability in terms of resistance response to 0-50% strain.

These sensors with outstanding sensing capabilities offer great potential in a number of areas such as electronic skins and wearable electronics.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



EMI SHIELDING EFFECTIVENESS SIMULATION OF EMI PROTECTION CLOTHING MADE FROM METAL COATED WOVEN FABRIC

Shi Hu[1], Dan Wang[1], Yordan Kyosev[2], Dana Kremenakova[1]

[1]Department of Material Engineering, Faculty of Textile Engineering,
Technical University of Liberec, Czech Republic
[2]Institute of Textile Machinery and High Performance Material Technology (ITM),
Technical University of Dresden, Germany

Contact person: shi.hu@tul.cz

Description:

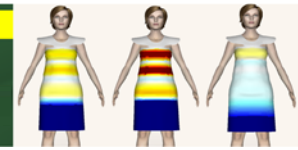
It is a simple and effective method to protect the human body from the harm of extra electromagnetic radiation in the environment by wearing clothing made from electromagnetic inference (EMI) shielding fabrics.

The metal-coated woven cloths are widely used in this field, but the EMI shielding effectiveness (SE) performance of these fabrics varies widely from 30dB to higher than 80dB.

It's essential to consider the parameters of metal-coated woven fabrics for designing the fabrics with accurate SE value.

This paper offered one effective simulation method running on ANSYS HFSS to simulate the SE performance with different parameters of the metal-coated fabrics with accurate SE values.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



COMPARISON OF TEXTILE ECG ELECTRODES FOR SENSORY CLOTHES

Khorolsuren Tuvshinbayar[1], Guido Ehrmann[2], Andrea Ehrmann[1]

[1]Bielefeld University of Applied Sciences, Faculty of Engineering and Mathematics, 33619 Bielefeld, Germany,
[2]Virtual Institute of Applied Research on Advanced Materials (VIARAM)

Contact person: andrea.ehrmann@fh-bielefeld.de

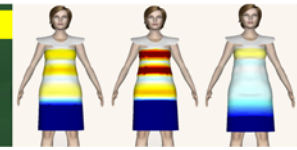
Description:

The electrocardiogram (ECG) measures electric signals characterizing the heartbeat. For long-term measurements, textile electrodes are more comfortable than glued ones, but usually suffer from insufficient or unreliable skin contact.

Here we present investigations of the skin contact of textile ECG electrodes in comparison with commercial ones by a simple test method.

The newly developed method also enables visualizing the effect of sweating under a coated textile ECG electrode.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



THE INFLUENCE THE TOTAL VOLUME OF AIR GAPS UNDER CLOTHING ON THE TOTAL THERMAL INSULATION – PILOT STUDY

Magdalena Młynarczyk, Joanna Orysiak, Jarosław Jankowski

Central Institution for Labour Protection – National Research Institute,
Czerniakowska St. 16, 00-701 Warsaw, Poland

Contact person: m.mlynarczyk@ciop.pl

Description:

The degree of fit of the garment (the total volume of air gaps under clothing) affects the garment's thermal insulation value. The determination of total volume of air gaps by means of a 3D scanning technique could therefore provide useful information for assessing garment fit. The aim of this study was to assess the relationship between total volume of air gaps and total thermal insulation. To test the total volume of air gaps under the selected clothing, a Newton thermal manikin and an iPad set were used (figure 1).

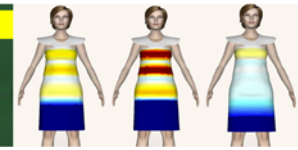
Figure 1. Sample of scanning process

The special underwear (three sizes) was scanned and the total volume of air gaps was calculated. The total thermal insulation of underwear was obtained from test done with thermal manikin and climatic chamber. It was shown that the volume of air gaps affects the values of total thermal insulation.

Acknowledgements:

This paper is published and based on the results of a research task carried out within the scope of the fifth stage of the National Program “Improvement of safety and working conditions” supported within the scope of state services by the Ministry of Family and Social Policy. Task no. 3.SP.04 entitled “Study of the influence of clothing adaptation on thermal insulation and water vapor resistance in the clothing - heat source system”. The Central Institute for Labour Protection – National Research Institute is the Program’s main coordinator.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



MOISTURE TRANSPORT IN COTTON WOVEN FABRICS OF DIFFERENT WEAVES AND LINEAR DENSITY OF WEFT YARN

Dominika Kamińska, Małgorzata Matusiak

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: dominika.kaminska@dokt.p.lodz.pl

Description:

Cotton is the most common raw material of natural origin applied of clothing manufacturing. Clothing currently available on the market is usually made of plain weave fabrics. As part of this study, 3 pairs of cotton woven fabrics with different weaves (plain, twill 2/2 S, transverse rep 1/1) and different linear density of weft yarn (60 tex and 100 tex) were tested.

The scope of research included determination of parameters characterizing an ability of fabrics to transport moisture in liquid form. The investigation were carried out on the Moisture Management Tester. The investigations allowed to assess the moisture transport of individual fabrics.

Acknowledgements:

Research partially funded by the National Science Center as part of the research project “Geometric, mechanical and biophysical parametrization of three – dimensional woven structures”; project no: 2016/23/B/ST8/02041

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022

THE IMPACT OF GLOVES ON HANDS AND FINGERS TEMPERATURE – CASE STUDY

Joanna Orysiak[1], Magdalena Młynarczyk[1], Emilia Irzmańska[2], Piotr Prus[1], Elżbieta Łastowiecka-Moras[1]

[1]Central Institution for Labour Protection – National Research Institute, Czerniakowska St. 16, 00-701 Warsaw, Poland,
[2]Central Institution for Labour Protection – National Research Institute, Wierzbowa St. 48, 90-133 Łódź, Poland

Contact person: joanna.orysiak@ciop.pl

Description:

The aim of this case study was to determine the hand and fingers temperature, as well as, blood volume changes in microvascular tissue under the skin due to low temperature. Young, healthy man (who used the gloves made from the polyester fibers with an acrylic lining) was examined at -1°C in climatic chamber, where the manual tasks were performed. During the tests in the chamber, the hand temperature was monitored, while before entering and after leaving the chamber, the infrared thermography camera and plethysmograph were used. It was shown, that both the temperature of the fingers and the hand decreased after exposure to cold (figure 1). In conclusion, the low temperature of the environment has a negative effect on the hand and fingers skin temperature, though the properly protective gloves were used.

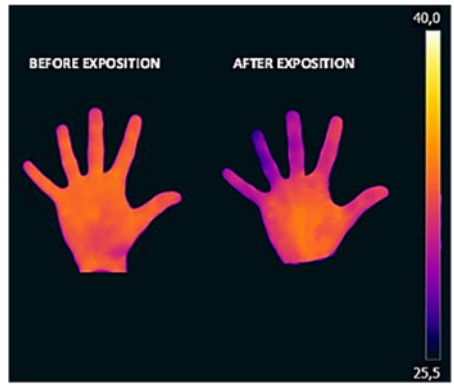
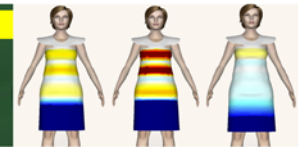
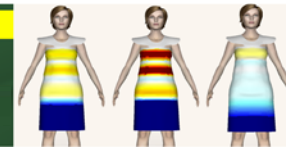


Figure 1. Sample of scanning process



Acknowledgements:

This paper is published and based on the results of a research task carried out within the scope of the fifth stage of the National Program "Improvement of safety and working conditions" supported within the scope of state services by the Ministry of Family and Social Policy. Task no. 2.SP.21 entitled "Investigation of the influence of cold and cold microclimate on the physiological responses of the worker during exercise manual work". The Central Institute for Labour Protection – National Research Institute is the Programme's main co-ordinator.



EXPANDED GRAPHITE/PVDF MICROPOROUS FILMS FOR ELECTROSTATIC DISSIPATION APPLICATIONS

Qingyan Peng, Xiaodong Tan, Mohanapriya Venkataraman, Jiri Militky

Technical University of Liberec, Department of Material Engineering,
Faculty of Textile Engineering, Liberec, Czech Republic

Contact person: qingyan.peng@tul.cz

Description:

Phase inversion method was introduced to fabricate an expanded graphite (EG)/ polyvinylidene fluoride (PVDF) microporous film that was proved to have a desirable electrical conductivity, good flexibility and mechanical strength, which could be applied in electrostatic dissipation (EDS).

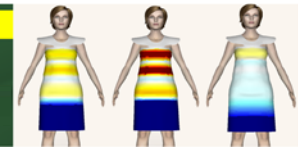
In this study, with the concentration of EG increasing from 0 wt.% to 5 wt.%, the electrical surface and volume resistivity of films decreasing from 1.78×10^{12} Ω and 4.31×10^{12} Ωcm to 4.79×10^{6} Ω and 5.55×10^{6} Ωcm, respectively.

After adding 2 wt.% EG, the Young's modulus of the film increases from 5.07 MPa to 11.68 MPa.

Meanwhile, the thermogravimetric analysis (TGA) shows that, compared to pure PVDF, the maximum degradation rate (T_{max}) of 5 wt.% EG film increasing by 16℃. Indicating that the prepared EG/ PVDF microporous film has a good prospect of application in the field of EDS.

.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



CAD IN THE DEVELOPMENT OF TECHNOLOGY OF A FASHION MINI COLLECTION BASED ON SELECTED CLOTHING CONSTRUCTION BASE

Katarzyna Świderska, Agnieszka Cichocka

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: agnieszka.cichocka@p.lodz.pl

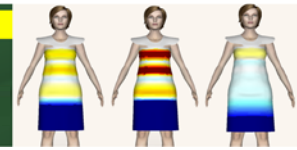
Description:

The thesis presents a CAD systems used to the process of preliminary pre-production of clothing on a mini-collection of women blouse example.

The concept of clothing blocks structure (also for personalization) was presented and used in the design of blouses.

A 3D simulation was also performed for all blouses from the collection to confirm. It has been shown that creating a database of clothing blocks gives a lot of possibilities for personalizing the product.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



ANALYSIS OF GEOMETRIC STRUCTURE OF WOVEN FABRICS SURFACE

Gabriela Kosiuk, Małgorzata Matusiak

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: gabriela.kosiuk@dokt.p.lodz.pl

Description:

Geometric structure of the surface influences different comfort-related properties of fabric.

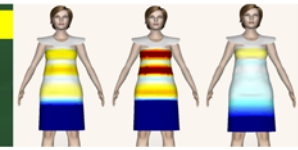
The aim of the presented research was to analyze the parameters characterizing the geometric structure of the surface of cotton woven fabrics with different weaves. Surface topography measurements were made by means of the MicroSpy® Profile profilometer and the Mark III software.

Based on the obtained results, the statistical analysis was performed in order to assess the influence of the structural parameters of fabrics on the geometrical structure of their surface.

Acknowledgements:

Research partially funded by the National Science Center as part of the research project "Geometric, mechanical and biophysical parametrization of three – dimensional woven structures"; project no: 2016/23/B/ST8/02041

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



THE EFFECT OF COMBINING THE CLOTHING FABRICS WITH ADHESIVE INSERTS ON THE BENDING RIGIDITY AND MULTI-DIRECTIONAL DRAPE

Michał Stępień, Iwona Frydrych

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: michaelstep@o2.pl

Description:

This piece of work concerns an examination of multi-directional drape and bending rigidity for eight woolen fabrics (for clothing) with three kind of adhesive inserts.

The aim of the study was to investigate the effect of combining the woolen fabrics with adhesive inserts from „Freudenberg Vilene" on the bending rigidity and multi-directional drape. Adhesive inserts were differentiated by the mass per square meter. Other parameters were exactly the same. Based on the scientific literature there were discussed issues related to testing methods of bending rigidity and multi-directional drape.

The content of work are test results of multi-directional drape and bending rigidity for fabrics with adhesive inserts and without. There was assessed the influence of mass per square meter and thickness of fabrics on the mentioned above parameters. By accurate analysis of results the conclusions were drawn out. All examinations aim at the proper selection of adhesive inserts for the designed clothing products..

PREPARATION AND CHARACTERIZATION OF CELLULOSE BASED FOAM

Xiaodong Tan[1], Qingyan Peng[1], Tereza Subrova[1], Jana Saskova[1], Jakub Wiener[1], Mohanapriya Venkataraman[1], Jiri Militky[1], Arunjunai Raj Mahendran[2], Herfried Lammer[2]

[1]Technical University of Liberec, Department of Material Engineering, Faculty of Textile Engineering, Liberec, Czech Republic,
[2]Wood K Plus- Competence Center for Wood Composites and Wood Chemistry, Altenberger strasse 69, A-4040 Linz, Austria

Contact person: xiaodong.tan@tul.cz

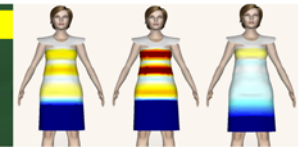
Description:

The cellulose based 3D porous foam was prepared by physical crosslinking and foaming technology.

The prepared foam material shows good properties of thermal stability, water loading and dye adsorption. The temperature of degradation is about 390℃ and the maximum water loading ration reach 700%. The largest methylene blue adsorption capacity of the foam is 110.81 mg/g.

The results show that cellulose based 3D porous foam is effective, promising adsorbent, which can be used to remove MB from aqueous solutions.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



EFFECT OF AUTOMATIC NESTING ON THE USAGE OF FABRIC IN WOMEN SHIRT PATTERN (CASE STUDY GEMINI AND GERBER SOFTWARE)

Siamak Nazemi

Islamic Azad University of South Tehran Faculty, Fashion and Textile Department, 198111 Tehran, Iran

Contact person: nazemi.textile@gmail.com

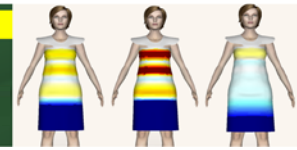
Description:

Goal: in the fashion industry, different software are used as nesting software most of them try to decrease fabric usage In their advertising, they speak about their advantage, but many different factors affected the usage of fabric in nesting processor. Some important factors are time, software algorithm, type of fabric, pattern design, etc. Gemini and Gerber was one of the most important and famous software in the fashion industry

Methodology: In this paper, women shirt pattern in 34-36-38-40-42 sizes as a pattern for nesting in both software, also nesting software run in 4 different times 10, 20, 30, 60 minutes. In the end, the results were compared with each other.

Results: Gerber software show less sensitivity to time but Gemini Software after 20 minutes has less sensitivity to time and the plot slot became steady. This means that for Gemini nesting module should consider time in their Nesting plan.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



IDENTIFYING AND RANKING NEW PRODUCT FACTORS OF FASHION INDUSTRY (CASE STUDY IRANIAN MENSWEAR BRAND)

Siamak Nazemi

Islamic Azad University of South Tehran Faculty, Fashion and Textile Department, 198111 Tehran, Iran

Contact person: nazemi.textile@gmail.com

Description:

In fashion industry creative idea and new product appear in new collection of brands which presented by several ways such as fashion week or exhibition and etc. Iranian menswear also had a same strategy but because of feature of their customers usually, use same design and product in their new collection. Achieving new product in fashion industry access in two different type: design and technology aspect of new product. here we looking for important factor affected on new product in Iranian menswear and also understanding which strategy they utilize in their product line.

In this paper, firstly gathering data from Iranian Fashion association and 3 big Iranian menswear brands, then by interview with expertise from Iranian menswear brand looking for answer of study question.

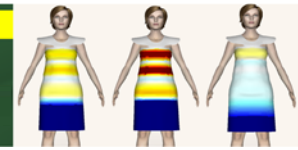
In this study twelve factors release from literature of study, they divided in four section: fabric sector, garment and accessories sector and market sector, in 2010-decade Iranian menswear brand focus on technology factor in their new product but during recent years they change their mind and now change direction to design department, these phenomena happen for impact of social media on Iranian culture, social media change behavior of Iranian customer.

In this study, access to director of menswear brands was so difficult and during their interview they try to hide some information.

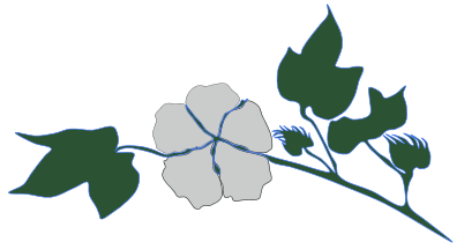
New product was an important factor in increasing market of any menswear brand which this study help them to utilize best strategy depended their customers and market.

This study confirmed that new product impact on customer behavior and culture which could be difference during time.

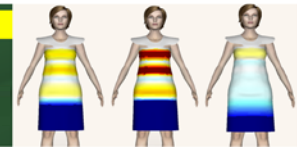
14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



INNOVATIVE TEXTILES



14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



FLAME RETARDANCY OF FLAX FIBER USING A PHOSPHORUS-CONTAINING IONIC LIQUID BY IONIZING RADIATION: COMPARISON BETWEEN PRE-IRRADIATION AND MUTUAL IRRADIATION

Fatma Zahra Sassi[2], Rodolphe Sonnier[1], Claire Longuet[1], Riadh Zouari[2], Ayda Baffoun[3], Slah Msahli[2]

[1]IMT – Mines Ales, Polymers Hybrids and Composites (PCH), 6 Avenue De Clavieres, 30319 Ales Cedex, France,
[2]Textile Engineering Laboratory LGTex, ISET KH, University of Monastir, 5070, Tunisia,
[3]Textile Materials and Process Research Unit, University of Monastir, 5000, Tunisia,

Contact person: sassifatma37@gmail.com

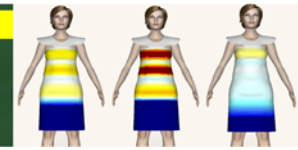
Description:

Flax fabrics were modified using a Phosphorus-containing Ionic Liquid by two different grafting procedures involving ionizing radiation, namely pre-irradiation, and mutual irradiation. The pre-irradiation grafting method was used to modify flax fabrics in two main steps. In the first step, flax fibers were irradiated at a dose ranging between 20 and 100 kGy and kept cold to preserve the radicals created during irradiation before being immersed in the second step. This last one consists of impregnating flax fabrics into an aqueous solution containing an ionic liquid monomer. Similarly, mutual irradiation was carried out in two steps.

The first is the impregnation of flax fabrics. Then, treated fabrics were irradiated with doses of 20, 50, and 100 kGy followed by three washings. Grafting efficiency was quantified by inductively coupled plasma atomic emission spectroscopy (ICP-AES). The location of the grafted phosphorus ionic liquid in the fiber structure was assessed using scanning electron microscopy coupled with energy dispersive X-ray spectrometry (SEM-EDX). Also, the impact of grafting Ionic Liquid onto flax fibers on fire behavior was tested using the cone calorimeter and the pyrolysis combustion flow calorimetry (PCFC). Different parameters such as the radiation dose, the temperature, and the duration of the reaction which could have an impact on the grafting efficiency were monitored during this work.

As a result, the ionic liquid monomer was well grafted into the bulk of elementary flax fibers using mutual irradiation. However, for the pre-irradiation, it was observed that the phosphonate monomer was eliminated.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



HYBRID SYSTEM OF LINE LIGHTING FOR ROAD SAFETY CLOTHING

Dana Kremenakova, Jiří Militký, Jana Šašková, Xiuling Zhang

Department of Material Engineering, Faculty of Textile Engineering,
Technical University of Liberec, Czech Republic

Contact person: dana.kremenakova@tul.cz

Description:

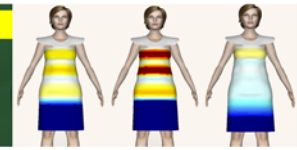
Passive and active visibility of subjects (especially pedestrians) is one of the key issues of road safety. Majority of solutions are based on the utilization of retroreflective materials functioning under direct illumination from external light sources only.

For these purposes it is proposed to use of hybrid illumination system composed from active and passive lighting elements.

As active lighting element, the linear composite consists from side emitting optical fiber covered by woven textile layer, power supply and LED light sources is developed. Passive lighting element is composed from textile tape coated by fluorescent pigments which emit light even after the active lighting is temporarily switched off. The selection of proper fluorescent pigments is based on measurement of time to decay of illumination intensity to the limited value of sufficient visibility in the dark. Main aim of proposed presentation will be description of basic properties of both active and passive part of hybrid system. The light intensity decay of both parts of hybrid system as a function of distance from LED will be measured by special device and described by simple model.

The analysis of hybrid illumination system will be realized by the other special testing device characterizing of illumination intensity in the phase of active and passive lighting. The extension of total illumination time by using of combination of active and passive illumination will be quantified. Based on the analysis the final hybrid system will be designed.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



VISUAL TEMPERATURE-REGULATING FABRIC

Kai Yang[1], Xiuling Zhang[1], Mohanapriya Venkataraman[1], Lenka Martinkova[2], Ondra Ctibor[2], Jakub Wiener[1], Guoqing Zhang[3], Guocheng Zhu[3], Juming Yao[4], Jiří Militký[1]

[1] Department of Material Engineering, Faculty of Textile Engineering, Czech Republic Technical University of Liberec,
[2] Inst Vecernik s.r.o., 468 21 Alsovice, Czech Republic,
[3] College of Materials and Engineering, Zhejiang Sci-tech University, P.R. China,
[4] Ningbo University, P.R. China

Contact person: kai.yang@tul.cz

Description:

Temperature-regulating fabric is usually realized by incorporating phase change materials (PCMs). However, the temperature of the PCM-incorporated thermal regulating fabric is unable to be detected immediately.

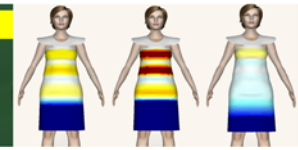
Incorporation of thermochromic pigments into PCM fabric is available to make temperature visible. In this work, the thermochromic PCM fabric was successfully fabricated by making a coating of MPCM and thermochromic pigments on the hydrophobic cotton fabric via pad-dry-curing method.

The morphology, thermochromic behavior, thermal energy storage and thermal buffering effect of the thermochromic PCM fabric were investigated.

As a result, the addition of MPCMs in the thermochromic fabric did not affect the thermochromic behavior by evaluating color changes in CIE image. Besides, the higher thermal energy storage was found about 18 J/g when there were MPCMs in the thermochromic fabric. Correspondingly, the thermal buffering effect of thermochromic PCM fabric was found.

We propose that the fabricated thermochromic PCM fabric can be applied in personal usages or industrial fields.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



EFFECT OF TWIST ON ILLUMINATION OF ULTRAFINE SIDE-EMITTING POLYMER OPTICAL FIBER-BASED BUNDLES

Xiuling Zhang, Kai Yang, Dana Kremenakova, Jiří Militký

Department of Material Engineering, Faculty of Textile Engineering,
Czech Republic Technical University of Liberec

Contact person: xiuling.zhang @tul.cz

Description:

Side-emitting polymer optical fibers (SEPOFs) are characterized to provide a strong and uniform illumines effect and have been applied in textile industry. Most SEPOFs incorporating into textiles have a relatively large diameter (2-3mm) and have a higher bending stiffness, which reduces the compatibility with textiles.

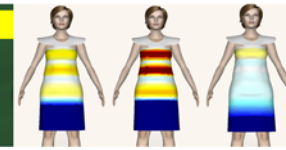
The SEPOFs with ultrafine diameters are proposed to be more flexible and more suitable for textiles, while the poor mechanical properties are taken into consideration. In this work, the ultrafine SEPOFs with diameter of 0.25 mm were used and different ultrafine SEPOFs were assembled into one bundle by applying different twists.

The overall side-emitting effect of ultrafine SEPOFs bundles with or without twists was investigated.

As a result, the illumination intensity of the SEPOFs bundles increased when more SEPOFs were used. Besides, the illumination intensity of the SEPOFs bundles decreased with the increase of twist degrees.

We propose that the work ignites the preparation of POFs-based bundles as well as extends application for textiles.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



BAST FIBRE BASED COSMETO-TEXTILES

Małgorzata Zimniewska[1], Barbara Romanowska[1], Katarzyna Schmidt-Przewoźna[1], Mariola Pawlaczyk[2]

[1]Institute of Natural Fibres and Medicinal Plants National Research Institute
[2]Department and Division of Practical Cosmetology and Skin Diseases Prophylaxis, Poznan University of Medicinal Sciences, Poland

Contact person: malgorzata.zimniewska@iwnirz.pl

Description:

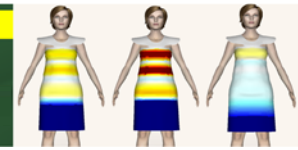
This paper covers results of study on development of linen/hemp clothing with ability to act as cosmeto-textile. The hemp and linen/hemp fabrics were naturally dyed with use of herb extracts supported by mordants characterized by antioxidant activity.

Additionally pure hemp fabric was enriched with cannabidiol (CBD) extracted from the panicles of industrial hemp plants. The whole value chain of hemp clothing production was design in the way, which allowed to monitor the processes from the hemp seeds sowing, harvesting, retting and fibre extraction, spinning, up to ready final product.

The clothing effect on wearer skin was tested by women in different age for 6 weeks.

Results of experiment confirmed, that long-lasting wearing of bast fibre clothing caused improvement of skin condition and had positive effect on the proper skin barrier function keeping.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



PRESENTING POSSIBILITIES FOR NON-TOXIC TEXTILE FLAME RETARDANTS

Rahel Krause[1], Isa Bettermann[1], Roshan Paul[1], Thomas Gries[1], Maximilian Nöth[2], Ulrich Schwaneberg[2], Claus Hummelsheim[3]

[1]Institut für Textiltechnik of RWTH Aachen University,
[2]Lehrstuhl für Biotechnologie of RWTH Aachen University,
[3]Klevers GmbH & Co. Kg

Contact person: rahel.krause@ita.rwth-aachen.de

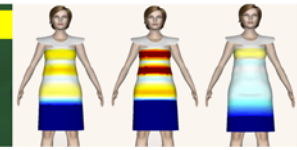
Description:

Fire protective fabrics play an important role in everyday live and cover a highly diverse spectrum of applications.

Efficient flame retardants are essential to ensure fire protection. However, many of these additives currently used are hazardous to health and the environment.

This paper highlights the possibility of non-toxic, flame retardants textile finishes and corresponding finishing processes for fire protective fabrics.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



SILVER-PLATED STRETCHABLE ELASTOMERIC ELECTRODES FOR ELECTROTHERAPY APPLICATIONS

Azam Ali[1], Mariyam Sattar[2], Mohanapriya Venkataraman[1], Jiří Militký[1]

[1] Department of Material Engineering, Faculty of Textile Engineering,
Czech Republic Technical University of Liberec,
[2] Department of Mechanical Engineering, Institute of Space Technology,
P O Box 2750, Islamabad, Pakistan

Contact person:azam.ali @tul.cz

Description:

The objective of present study was to develop multifunctional and wearable electrically conductive electrodes for TENs application, with acceptable hygienic properties by silver deposition. The electrodes were developed in two stage. At first conductive particles were dispersed into flexible elastomer, then silver electroplating was performed.

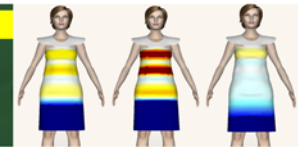
Dynamic light scattering, XRD and SEM analysis were employed to study the morphology of developed electrodes. To improve the properties of electrode (when it is subjected to various movement of human body), the conductive elastomers were subjected repeated extension and change in resistivity with stretch was observed.

By increasing the degree of extension, very small change in electrical resistance was observed. So it can almost be considered a constant value in the stretch range of 0–60%. The electrical resistance increased after 70% of stretch. However, the elastomers resistivity was well maintained after repeated extension even over 100 cycles.

Furthermore, there was insignificant change in resistivity with time at constant current was observed. Moreover, the role of deposited silver particles on hygienic properties (antibacterial, antifungal, toxicity, and antiviral properties) was examined against different pathogens. At the end, the durability of developed electrodes and electrical properties were examined against several washing cycles.

The electrodes showed good retention of the particles, proved by SEM microstructures and small loss in the conductivity and hygienic properties of the material after washing..

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



ANTIBACTERIAL ACTIVITY OF ZnO NANORODS COATED COTTON FABRICS

Muhammad Zaman Khan[1], Dana Kremenakova[1], Jiří Militký[1], Michal Petru[2]

[1] Technical University of Liberec, Faculty of Textile Engineering, Czech Republic,
[2]Department of Machinery Construction, Institute for Nanomaterials, Advanced Technologies and Innovation (CXI), Technical University of Liberec, Studentská 1402/2, 46117 Liberec

Contact person: zamankhan017@yahoo.com

Description:

In this present research, a microwave hydrothermal method was employed for quick synthesis of vertically aligned ZnO nanorods on surface of the cotton fabric. Two step approaches was used for the growth of ZnO nanorods.

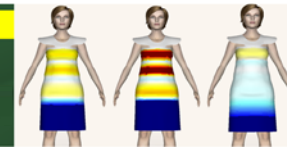
First, cotton fabric was coated by seed layer of ZnO nanocrystals by sol gel method. Secondly, ZnO nanorods were grown rapidly on the seeded cotton fabrics by microwave hydrothermal method. The effect of microwave power on the growth of ZnO nanorods was investigated in detail using scanning electron microscopy (SEM).

The topography of the cotton fabrics was observed by using atomic force microscopy (AFM). To study the structural properties of ZnO nanorods EDS analysis and X-ray diffraction (XRD) techniques were used. It was found that microwave power has a great effect on the structure and growth of the ZnO nanorods.

The microwave power was found to have a great influence on both the axial and lateral growth rates of the nanorods. The ZnO nanorods coated cotton fabrics demonstrated the ability to kill the bacteria and to prevent its growth.

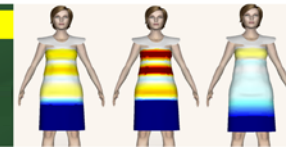
The coated cotton fabrics showed good antibacterial activity against the S. aureus and E. coli after 24 hours incubation due to its photocatalytic nature.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



COMFORT

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



THE COMFORT RELATED PROPERTIES OF THE EMI SHIELDING CLOTHING MATERIAL WITH ANTI-WASH TREATMENT

Dan Wang[1], Shi Hu[1], Yordan Kyosev[2], Dana Kremenakova[1]

[1]Department of Material Engineering, Faculty of Textile Engineering,
Technical University of Liberec, Czech Republic
[2]Institute of Textile Machinery and High Performance Material Technology (ITM),
Technical University of Dresden, Germany

Contact person: shi.hu@tul.cz

Description:

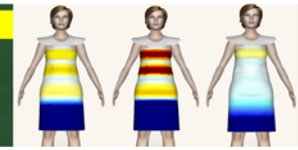
The wearing comfort of metal coated EMI shielding clothing has been studied in recent years. One of the key issues is to balance the wash-ability and wearing comfort properties. This paper uses ultrathin nonwoven polyester with copper-coated fabric as EMI shielding material.

After parylene encapsulation treatment, the wash-ability is increased significantly without block all the apertures of the fabric.

In this paper, the wearing comfort of this developed EMI shielding textile is analyzed and compared with the untreated fabric.

The test result showed optimized washability and decent wearing comfort properties.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



LIQUID MOISTURE TRANSPORT IN KNITTED FABRICS IN A RELAXED AND STRETCHED STATE

Otgonsuren Sukhbat, Małgorzata Matusiak

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: malgorzata.matusiak @p.lodz.pl

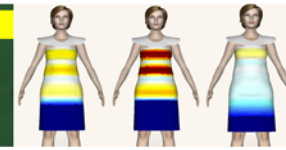
Description:

The aim of presented work was to analyze the influence of stretch on liquid moisture transport trough the knitted fabrics for T-shirts.

5 variants of cotton and cotton blended fabrics were measured by means of the Moisture Management Tester. Measurement have been performed for samples in the unstretched state and samples stretched by 15%. To precisely stretch the fabrics the MMT Stretch Fabric Fixture has been applied.

The results have been analyzed statistically in order to assess the influence of stretch on the parameters characterizing the moisture transport through the fabrics.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



THE ANALYSIS OF CLOTHING MICROCLIMATE CONDITIONS FOR LOWER BODY PART WORKWEAR DEDICATED FOR MOTOR IMPAIRED EMPLOYEES

Izabela Jasińska, Katarzyna Śledzińska, Violeta Jarzyna, Lidia Napieralska, Ewa Witczak

Łukasiewicz Research Network - Textile Research Institute,
92-103 Łódź 5/15 Brzezińska Str., Poland

Contact person: izabela.jasinska@lit.lukasiewicz.gov.pl

Description:

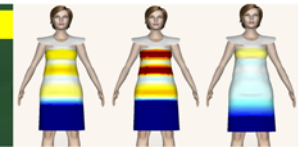
The workwear dedicated for motor impaired employees were designed. The woven fabrics used meet the requirements for light to moderate effort according to PN-P-08525:1998, reaching suitable level of water vapor resistance meanwhile.

The workwear's design was carefully chosen to meet the requirements of moto impaired employees during their work activities.

The analysis of microclimate were carried out to investigate the garment's ability to transport water vapor outside from gaps between body part and item of clothing.

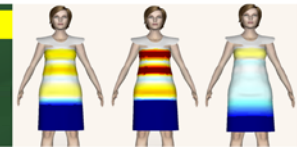
The two sets of workwear were tested, showing that both garment's construction and woven fabrics properties influence thereon.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



SCANNING & MODELLING

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



AUTOMATIC ANALYSIS OF HIGH SPEED (4D) BODY SCANNING DATA OF CLOTHED HUMANS– RESULTS AND CHALLENGES

Yordan Kyosev, Tino Kühn, Ann-Malin Schmidt

Technical University of Dresden, Institute of Textile Machinery and High Performance Material Technology (ITM), Dresden, Germany

Contact person: yordan.kyosev@tu-dresden.de

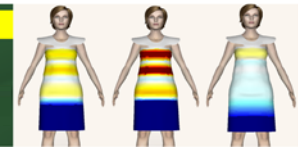
Description:

Modern hardware makes high speed 3D scanning (4D scanning) of moving clothed humans possible and opens new possibilities for optimization of the pattern in order to provide improved clothing comfort.

At the same time the high speed scanning process generates a large amount of data which analysis over times series is not more as efficient as it is for single 3D frames.

This contribution reports the latest steps in the area of evaluation of high speed scanned data sets of humans with clothing and the latest development of the algorithms for automatic evaluation.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



METHOD FOR FLATTENING OF A SURFACE OF A THREE-DIMENSIONAL BODY FOR KNITTING AND COMPUTING OF KNITTABLE PATHS

Franz Dietrich[1], Max Eschenbach[2]

[1] University of Applied Science Potsdam, Germany;
[2]Technical University Darmstadt, Germany

Contact person: franz.dietrich@fh-potsdam.de

Description:

The findings relates to a method for producing a development of a surface of a three-dimensional body that can be produced by knitting, with the method steps:

a. Representation of the surface of the three-dimensional body on a display device

b. Setting at least one cut in the surface of the three-dimensional body

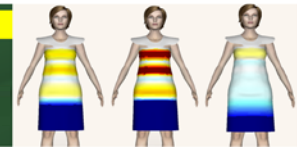
c. Producing at least one development of the incised surface and / or a section of the surface

d. Assessing the quality of the at least one resolution on the basis of at least one given criterion

e. Repeat steps b - d until the at least one criterion is met.

After meeting the criterion, an Algorithm based on graph-optimization computes knittable paths for knitting flatbed technology.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



YARN LEVEL SIMULATION OF WARP-KNITTED CLOTHING ELEMENTS - FIRST RESULTS AND CHALLENGES

Haisang Liu[1,2], Yordan Kyosev[1], Gaoming Jiang[2]

[1]Technical University of Dresden, Institute of Textile Machinery and High Performance Material Technology (ITM), Dresden, Germany
[2]Jiangnan University, China

Contact person: sophie@stu.jiangnan.edu.cn

Description:

To simulate the warp-knitted product with a specific shape, a mesh based model is for the modeling and simulation is proposed.

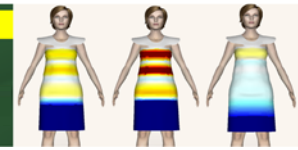
The three-dimensional geometry of the final fabric is represented as set of mesh of polygons, each of them containing the information about the 3D orientation of the yarns in the warp knitted structure.

Using spatial mapping, stitch coordinates from the flat mesh model to the three-dimensional mesh model were transformed and the final rendering is accomplished.

The method provides yarn level data for the complete structure and can be used for speeding up the design process of clothing with warp knitted products. Several challenges with the larger data amount and possible ways for their solutions are discussed.

.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



PARAMETRIC MODELING OF SHOE SOLES ACCORDING TO PLANTAR PRESSURE MAPS

Tatjana Spahiu[1] , Yordan Kyosev[2], Henrique Almeida[3], Sarghie Bogdan[4], Panagiotis Kyratsis[5]

[1] Polytechnic University of Tirana, Albania,
[2]Technical University of Dresden, Institute of Textile Machinery and High Performance Material Technology (ITM), Dresden, Germany,
[3]Polytechnic Institute of Leiria, Leiria, Portugal,
[4]Technical University of Iasi, Rumania,
[5]University of Western Macedonia, Greece

Contact person: tspahiu@fim.edu.al

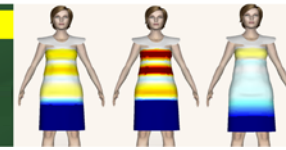
Description:

This paper aims to develop an algorithm for 3D modeling of shoe sole using Grasshopper a visual programming editor according to different plantar pressure maps.

As shoe sole absorb ground forces generated during daily activities as walking or running, the generative algorithm offers the possibility to customize footwear components according to their functionality in order to improve their performance.

3D printing will help to customize these soles to be used for the final shoe prototype.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



EVALUATION AND OPTIMISATION OF TEXTILE ULTRASONIC WELDING BY USING TRANSIENT NUMERICAL THERMAL ANALYSIS

Yordan Kyosev, Alexander Reich

Technical University of Dresden, Institute of Textile Machinery and High Performance Material Technology (ITM), Dresden, Germany

Contact person: yordan.kyosev@tu-dresden.de

Description:

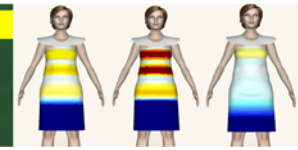
The ultrasonic welding process serves as an efficient method for the watertight joining of thermoplastic fabrics. It is used in the manufacturing of functional garments such as chemical protective workwear or sportswear.

This paper presents the possibility of evaluating and optimising ultrasonic welding process by means of transient thermal analysis to improve the overall seam quality.

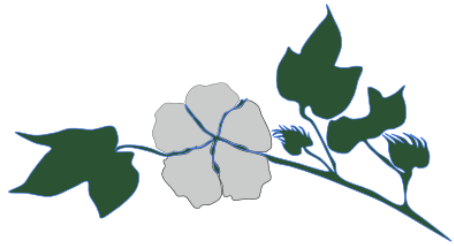
This paper presents the current state of the art of ultrasonic welding process, heating of the textile, and the joining process of welding.

Furthermore, the transient heat flow through the textile is investigated by means of FEM methods by considering different influencing factors (e.g. changed material combinations, varying joining temperatures) in the paper.

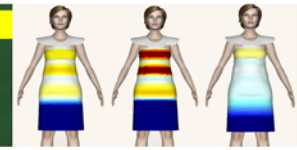
14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



CLOTHING TECHNOLOGY (FIT)



14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



3D GARMENT FIT ON SOLID AND SOFT DIGITAL AVATARS – PRELIMINARY RESULTS

Elena Alida Brake[1], Yordan Kyosev[2], Katerina Rose[3]

[1] Reutlingen Research Institute, Germany,
[2]Technical University of Dresden, Institute of Textile Machinery and High Performance Material Technology (ITM), Dresden, Germany,
[3]Reutlingen University, Germany

Contact person: elena.brake@reutlingen-university.de

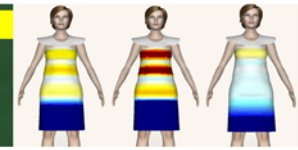
Description:

For a holistic assessment of the interaction between the human body and tight fitted clothing, it is necessary to consider the mechanical properties of the body. Default avatars are solid and don't take these into account.

For the current purpose such an avatar is converted to a deformable one, using the soft body physics implementation in a modern rendering engine.

The fit of a 3D garment on a solid and the modified soft body are compared, this allows a first evaluation of the accuracy of the pressure computation of the clothing to the body.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



EVALUATION OF GARMENT SIMULATIONS WITHIN AN ANALYTICAL FIT TEST

Christian Pirch, Anke Klepser

Digital Fitting Lab, Germany

Contact person: c.pirch@hohenstein.com

Description:

Digital tools in product development can validate the design idea of the product early on, but what about the fit. The virtual fit check of a pattern can be carried out in the systems through visual aspects or the fitting maps provided. The analysis includes, for example, looking at the excess or short widths at the relevant circumferential measurements. For this, the differences between the body and product measurements are determined. The basis is the assumption that the positions, e.g. bust circumference and bust width, are identical when dressed. But is that the case? Virtually, the positioning can be exactly compared and examined.

Method

For this purpose, the basic pattern of a garment is simulated over 4 DOB avatars of German size 38 (bust girth 86-90 cm) with different bust shapes. The simulations are then examined within a grid analysis in the software Rhinoceros 6.0. Within this analysis are considered: The balance of the bust line, hem seam and side seam, as well as the positioning of the bust points in the cut related to the position in the simulation. The results are recorded in numerical values and then analyzed.

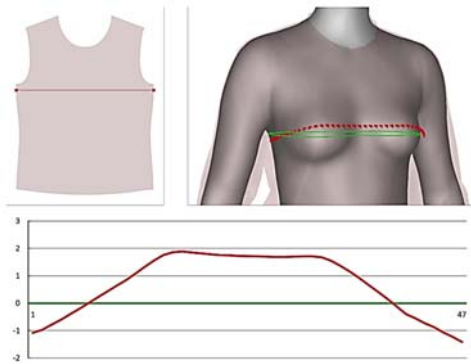
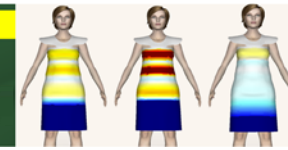


Figure 1. Representation of data collection

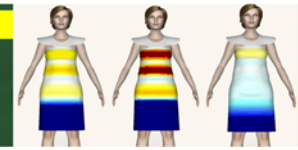


The figure shows the chest line drawn on the section. By checking the difference in height, the balance of the chest line can be checked in the simulation and evaluated numerically.

Potential

The virtual comparison allows an objective assessment of the fit for the examined avatars. The positioning of the relevant lines on the product can be compared exactly with those on the body. Deviations can be documented and evaluated by the method with numerical values. It is expected that a differentiation can be achieved through the targeted analyses based on the developed method, analyses of further products and avatars are planned. In addition, the development of supplementary methods for the evaluation of fit is planned.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



UNDERSTANDING THE APPLICATIONS FOR 3D BODY PROCESSING 'FIT ANALYSIS' TOOLS AS PART OF DRIVING SUSTAINABILITY

Randy Rannow[1], Emma Scott[2], Carol McDonald[3]

[1] Silverdraft Supercomputing, Boise, ID USA,
[2] Fashion Should Empower Research Group, Vancouver Island, BC CA,
[3] Gneiss Concept, Washougal WA, USA

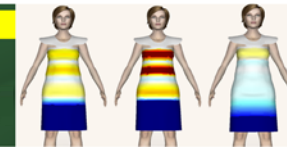
Contact person: c.pirch@hohenstein.com

Description:

The past decade has seen an explosion of evolutionary solutions directed at solving the apparel industry's greatest challenges. Misunderstandings regarding the scope of technology applications, coupled with the physiological, psychological, aesthetic, and heuristic complexities of apparel fit, have been problematic toward widespread adoption.

The IEEE 3D Body Processing Industry Connections Group (3D BP IC) is focused on disseminating information on the challenges for apparel digitization. Use case studies and focus groups involving global participants from diverse fields have identified a lack of common terminology, coupled with the use of broad scope language as major hurdles. Toward standard development for 3D BP, this paper will discuss 'fit' and 'avatars' as spectrums of results rather than frequently misunderstood and therefore ambiguous outcomes. For example, the use of smart mirrors has been shown to reduce retail garment returns. This technology even has application for on-demand manufacturing, but it does not (yet) provide sufficient data to drive bespoke garment production. On the other hand, Made-to-Measure (MTM) garments produced from customer body scans and personalized 'fit preference' are frequently found unsatisfactory. Further, definitions for 3D humanoid or avatars include Fixed Dimension, Form Modifying, Individual Static, Individual Form Modifying and Perfect Clone, with numerous colloquial reference and attributes ranging from Fixed body shapes to "Deep Fake" with voice and facial movements.

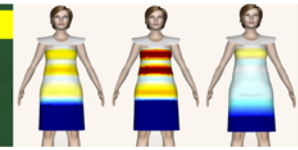
The question becomes, in using these Avatars, what is the path forward in understanding Fit? Indeed, is there an objective interpretation of fit? Understanding of how 3D BP technologies improve 'fit analysis' driving sustainable practice, an overview of application use-cases is paramount. Toward this, discussion here will offer various use-cases for an overview of how virtual humanoid and garment offerings relate to physical body and physical garment and their apparel use-case applicability. Only with a combination of offerings will the goal of sustainable apparel practice be achieved because, here too, Ready-to-Wear (RTW), Made-to-Measure (MTM), and Bespoke are



parts of a whole physical ecosystem. While it was once thought that Make-to Measure would be the full future solution, we now understand on-demand RTW has as much to offer sustainability initiatives as Bespoke offerings, and somethings more. With a broader understanding of scope of application, it becomes apparent that apparel digitalization, and future XR environments, will require an ecosystem of technologies. Each offering is a piece of the puzzle and not the complete puzzle.

We will discuss virtual garments and humans using use-case scenarios as initiatives for RTW, MTM, and bespoke and how this enables sustainability.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



THE IMPORTANCE OF THE ACCURATE REPRESENTATION OF 3D MODELS FOR THE APPAREL INDUSTRY

Monika Balach, Agnieszka Cichocka, Iwona Frydrych

Lodz University of Technology, Faculty of Material Technologies and Textile Design, Institute of Architecture of Textiles, 116 Zeromskiego St., 90-924 Lodz, Poland

Contact person: monikabalach@mail.com

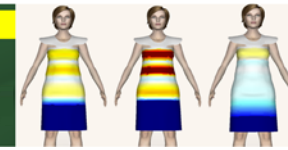
Description:

Modern generations, especially those born between 1995-2012 (the so called 'generation Z') have grown up surrounded by advanced technology from a very early age. Young people between the age of 20 and 35 are very savvy with smartphones, computers and social media activities. Their lifestyle is heavily dependent on technology such as social media websites used for communication. Many aspects of modern-day life can now be controlled/accessed through the internet, for example communication, entertainment, shopping, controlling finance, etc. The apparel industries must adapt to this rapidly developing technological age in order to remain relevant.

CAD/CAM systems have developed rapidly in recent years and pattern creation technology has greatly improved. Users are now able to use a special function that uses human measurement data to generate garment patterns. 3D cloth draping simulations have also improved as well as cloth topology. Cloth attributes such as weaving, texture, fabric print and colour can be easily displayed, which helps the developer to create a realistic looking garment that satisfies all design criteria.

The author of this paper intends to explain the importance of creating a realistic 3D representation of the human body for the virtual fitting of garments. It is also important to understand customer needs in order to improve customer satisfaction when shopping online. Modern technology has made it possible to achieve realistic 3D representations of the world, however, avatars which represent the human body still tend to look unnatural.

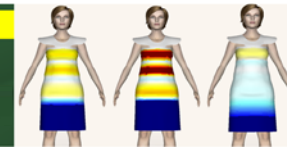
One possible reason for this is that the developers who created the avatar were trying to make it look visually attractive with a slim, symmetrical hourglass body shape in order to appeal to their customers. However, this is an unrealistic generalization and most humans do not conform to this 'ideal' body shape. In the real world, people have different weights, heights and body shapes and it is important for us to accept ourselves as we are. It is obvious that a garment designed to fit a slim hourglass figure will not fit correctly on a larger apple shape body. The use of a generic hourglass avatar may result in an aesthetically pleasing hourglass shaped garment; however, the most important factor is how it fits on the real-life customer who usually ends up disappointed by the fit.



By developing more realistic shaped avatars, clothing industries will be able to increase customer satisfaction and reduce return rates which will also help the environment by reducing carbon footprint. A realistic avatar which has accurate body topology, authentic looking skin, customer's own face, hair and all other necessary details will help the customer to identify themselves with the 3D model, which in turn will help them to choose garments that not only fit their body shape but also flatter their skin tone, eye colour, etc.

This work presents the stages involved in creating a realistic avatar, from initial avatar generation using a body scanner to the creation of skin, eyes, hair, etc. The author of this paper believes that it is possible to achieve perfect fitting garments for customers by introducing realistic customer-based avatars for all sizes to the CAD/CAM software. It is now time for the apparel industry to focus on the fit of their clothes on their target customers rather than making sure that they fit correctly on a perfect hourglass shape avatar.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



TRENDS IN TECHNOLOGY TRANSFORMATION FOR TEXTILE INDUSTRY AND EXAMPLE FOR ITS IMPLEMENTATION

Olga Paraska[1], Bartosz Bartkowiak[2], Tomasz Klorek[2], Tomasz Buratowski[3], Lubos Hes[4]

[1]Khmelnytskyi National University, Ukraine,
[2]VISBROKER Sp. z o.o., Poland,
[3]AGH University of Science and Technology, Poland,
[4] Technical University of Liberec, Czech Republic

Contact person: olgaparaska@gmail.com

Description:

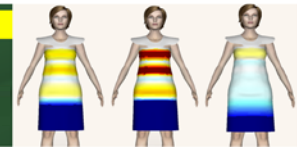
The current technological development makes it possible to optimize the costs of many economic processes. The use of a mechatronic devices supported by appropriate sensors system may enable a more accurate selection of various types of products. The article presents the application of the developed comprehensive system that allows to check the fit of selected elements of clothing.

This process is carried out with the help of the mechatronic model of a mannequin under development and a vision system that enables scanning of the human body.

This system is designed to collect data in the form of basic human dimensions and provide data in order to properly set the dummy modules, so that it is possible to assess the fit of a selected item of clothing, e.g. a shirt, for those interested in its purchase customers. In the case of the use of this type of systems, an important factor is the reduction of the number of returns of ill-fitting clothing in popular stores based on order sales.

SUSTANABLITY & FASHION

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



SUSTAINABLE COLLECTION DEVELOPMENT TOWARDS GREENER FUTURE: EARTHKEEPERS

Tayfun Güven[1], Bahar Akarsu[1], Eray Sudaşdemir[1], Elçin Emekdar[2], Umut Kıvanç Şahin[2], Senem Kursun Bahadı[3]

[1] Gelişim Textile, Turkey,
[2] ITU Faculty of Textile Technologies and Design,
[3]P ITU Mechanical Engineering Faculty, Turkey

Contact person: emekdar@itu.edu.tr

Description:

In textile and apparel industries, there are huge environmental risks at all stages of the production from raw material to finished product/garments due to large amounts of chemical loads, high amount of water usage, high energy consumption, air emission, solid waste and odor formation. Due to this fact, sustainable development, sustainable manufacturing, sustainability assessment are key performance measures to evaluate the environmental dimension of a textile company.

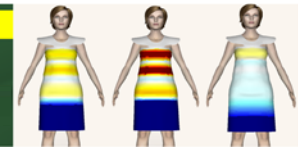
This paper aims to raise awareness about sustainable development in the textile and apparel sector in order to create the necessary knowledge in the sector and to contribute to the protection of the environment. Within this context, in this study a collection has been created from sustainably sourced materials using recycled, environmentally friendly cotton and recycled polyester, nylon and wool fleece fabrics.

Moreover, each component of the collection has also been created using recycled accessories such as recycled zipper, relmet, extrafor, cord etc. In the collection, natural tones inspired from the nature were used as print color tones e.g colors of colorful flowers on the lands and mountain, yellow rays of the sun and blue sky etc.

All collection was tested for color fastness to washing, light, perspiration, rubbing and water. Test results revealed that the collection has passed all the performance criteria according to ISO standards and approved by famous apparel brands. As being one of the large textile company in Turkey, we hope that we encourage all stakeholders in the textile sector and lead them to a way of recycled clothing products.

By getting into era of sustainability and highlighting the urgency of the climate crisis with our sustainable collection.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



UPCYCLING IN THE DESIGN OF ARTISTIC FABRICS AND CLOTHING AS ONE OF THE ACTIVITIES IN SUSTAINABLE FASHION

Monika Bogusławska–Bączek[1], Justyna Szymczyk[2]

[1]University of Technology in Katowice, Faculty of Architecture, Civil Construction and Applied Arts, Department of Design, Poland,
[2]University of Economics in Katowice, Faculty of Management, Department of Marketing Management and Tourism, Poland

Contact person : monika.boguslawska@wst.com.pl

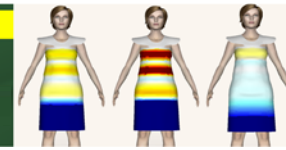
Description:

Sustainable fashion is finding a balance between the processes of design, production and consumption of material goods. The clothing industry is one of the most polluting industries in the world. This is mainly due to the consumerist approach to fashion and its bad Fast Fashion behavior.

The solution is Slow Fashion, i.e. a conscious and ethical approach to clothes. Consumers' awareness is very important in it, especially about the techniques, conditions and raw materials used in production, as well as the possibilities of reusing raw materials and products, e.g. recycling or upcycling.

The paper presents examples of the use of creative upcycling involving the use of used T-shirts for the production of knitting yarns, from which new unique clothing products were made, as well as original paintings - macrame in the form of artistic fabrics and other interior decorations.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



COMPOSITES OF OYSTER MUSHROOMS AND TEXTILES FOR CLOTHING APPLICATIONS

Al Mamun, Dato Kapanadze, Lilia Sabantina

Faculty of Engineering and Mathematics, Bielefeld University of Applied Sciences, 33619 Bielefeld, Germany

Contact person: lilia.sabantina@fh-bielefeld.de

Description:

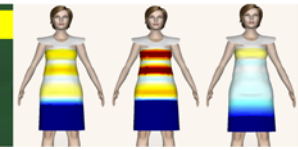
Nowadays, mycelium-bound composites are novel environmentally friendly, cost-effective and sustainable materials that facilitate the energy-efficient production of bio-composites and represent a promising substitute for synthetic materials. Current research on mycelium-bound composites focuses on relatively coarse material compositions from organic wastes including cotton scraps, sawdust, leaves, and biowaste, etc.

According to the research, there are very few publications on mycelium-reinforced composites with textile surfaces such as textiles and nanofiber mats, and this topic has not been sufficiently researched and the production of mycelium-reinforced nanocomposites is a novelty. The production of carbon fibers from fungal mycelium and fungal mycelium composites is also under-researched.

These fungal mycelium-based composites are promising for use in areas of protective clothing, e-textiles, and smart clothing as a sustainable and environmentally friendly alternative.

In this study, first attempts were made to apply the manufacturing process such as sewing, ironing and reinforcing with adhesive for mushroom mycelium/textile based composites.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



DIGITAL TRANSFORMATION OF THE APPAREL INDUSTRY - IDENTIFICATION OF A BEST PRACTICE APPROACH FOR SUCCESSFUL DIGITIZATION

Robert Nafz

Technical University of Dresden, Germany

Contact person: robert.nafz@googlemail.com

Description:

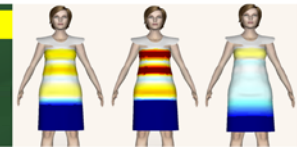
New digital technologies, the Internet age, and ever-increasing customer expectations are changing industries worldwide. Companies in the apparel industry must digitally transform to remain competitive.

Traditional approaches will no longer work in the face of change because digital transformation is inevitable, irreversible, enormously fast, and unfortunately marked by challenges in implementation and uncertainties in execution. However, it also brings many benefits for which it is worth striving for the complete digitization of the value chain.

This research paper aims to clarify the benefits and challenges companies face in digital transformation. For this purpose, it shows a report on the current state of digitalization in the apparel industry. In addition, it clarifies the benefits and challenges of digital transformation.

The article ends with a best practice approach on the implementation of digitization in the apparel companies.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



DEVELOPMENT OF A RESOURCE-SAVING AND SERVICE-ORIENTED SHOPPING EXPERIENCE

Michael Ernst, Antje Christophersen

Niederrhein University of Applied Sciences, Germany

Contact person: michael.ernst@hs-niederrhein.de

Description:

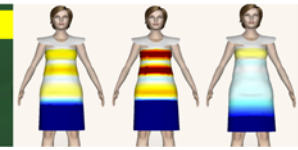
Nowadays Ecommerce and E-shopping become more and more popular, affected by the actual pandemic situation on one side but especially driven by technology and society transformation on the other. The product development process in textile and clothing industry is in steady transition, implementing more and more digital and especially virtual tools within the past years.

Customers' desire for service and shopping experiences is increasing in online retailing, as well as their awareness of resource-saving and sustainable shopping. Satisfying these needs more and more E-shops pop up on the market trying to offer a so-called sustainable shopping experience for potential customers. Thereby burning questions such as size and fit prediction, style counselling, virtual twins and avatars and especially the virtual try-on and virtual closets appear “on the stage”, crying out for innovative solutions.

To serve these customer needs, a virtual shopping scenario was designed with the use of different 3D CAD technologies. Clothing products are simulated up to photo-realistic results in all available sizes. For a virtual try-on, avatars in appropriate sizes and different types are created and provided to the customer as a representative for the virtual try-on. At the online store, the customer can now interactively try on the clothing range on the avatar he or she has selected and thus make a conscious purchase decision with regard to fit and appearance.

This offer was supplemented by the possibility of adding clothing items from the store as well as from the customer's own closet and thus to try on and evaluate different combinations directly online.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



POST-CONSUMER TEXTILES WASTE – CHALLENGE OR OPPORTUNITY?

Jarosław Chermanowicz

IKEA Purchasing Services Poland Sp. z o. o., Poland

Contact person: jaroslaw.chermanowicz@inter.ikea.com

Description:

The postconsumer textiles waste can be seen in two aspects: as a challenge and as opportunity.

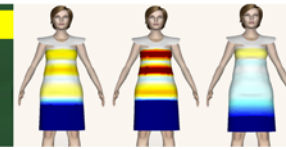
During this short lecture we would like to show where and how post- consumer textiles could be use in home textiles products as replacement of virgin fibers.

We will try to share our thoughts which parts of textiles technology should be develop in order to support post-consumer fibers implementation.

It seems, that efficiency of post-consumer textiles preparation, post-consumer materials sorting, fiber extraction and spinning are critical for possibility of industrial use of this feedstock.

We can see pretty quick development for all above parts, however some challenges still exist and a lot things could be improve.

14th Joint International Conference
CLOTECH 2022
HYBRID EVENT
September 5-8, 2022



AN INNOVATIVE ERP INTEGRATED SOFTWARE WITH SECURE AND REMOTE ACCESS ROLE FOR READY-TO-WEAR COLLECTIONS: ASTER DESIGN DEPOT VISUAL STUDIO

Volkan Şen[1], Zümrüt Tümer[1], Umut Kıvanç Şahin[2], Senem Kursun Bahadır[3], Hatice Açikogöz Tufan[2]

[1] Aster Textile, 34517, Istanbul, Turkey,
[2] ITU Faculty of Textile Technologies and Design, Istanbul, Turkey,
[3] ITU Mechanical Engineering Faculty, Istanbul, Turkey

Contact person: volkan.sen@astertextile.com

Description:

In this project, an innovative ERP integrated software, namely Aster Design Depot (ADD) Visual Studio 2022 was created using ASP.NET Core. Prior to software development, current design and production data on various garment types were collected, classified, visualized by photo shooting and/or sketching and stored as database with MS SQL Server which was connected with the ERP system of the company. Filtered data of any kind can be provided with real-time feedback to hierarchically-authorized users including third parties online.

The developed software intended for ready-to-wear/fashion industry to deliver fashion collections in a systematic and controlled manner so that decision makers can visually see online and categorize all new collections together with their product lines while enabling vendors to collaborate over the internet with a secure access.

14th Joint International Conference

CLOTECH 2022

HYBRID EVENT

September 5-8, 2022