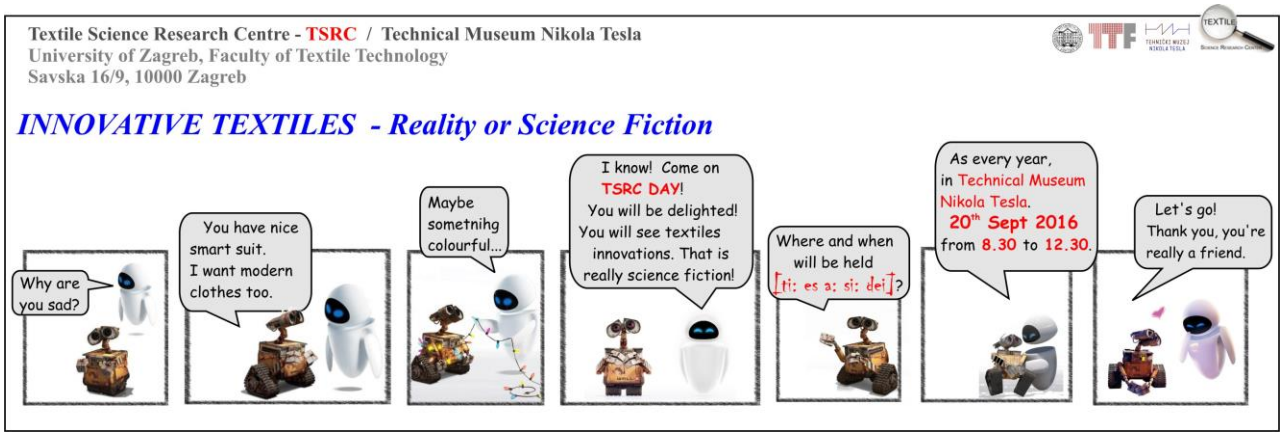
Sveučilište u Zagrebu / University of Zagreb
Tekstilno-tehnološki fakultet
Faculty of Textile Technology

Textile Science Research Centre (TSRC)

TEXTILE
SCIENCE RESEARCH CENTER



Event*:* Textile Science Research Centre Open Day 2016

Place: Technical Museum Nikola Tesla, Small hall, Savska street 18, Zagreb
Date: September 20th 2016
Schedule: According to the TSRC 2016 agenda
Organizing institution: University of Zagreb Faculty of Textile Technology, Textile Science Research Centre (TSRC)
TSRC head: Tanja Pušić

Textile Science Research Centre (TSRC) was established in 2008 at the University of Zagreb Faculty of Textile Technology. On the occasion of TSRC Open day it presents textile research and artistic potentials with the aim to popularize textile science. This years topic is chosen to be: ***INNOVATIVE TEXTILES – Reality or Science Fiction***.

TSRC 2016 AGENDA

8.30-9.00	***Registration***
	LECTURES
9.00-9.15	Textile Science Research Centre today
9.15-9.35	Innovation in textile and clothing sector
9.35-9.55	From skin to skin
9.55-10.15	Functional nanofibers – the product of the frontier technology of electrospinning
10.15-10.35	Invisible colours
10.35-11.10	***Coffee break***
11.10-11.30	3D flattening – application possibilities in clothing, footwear, automotive and furniture industry
11.30-11.50	Innovative filters from cationized cellulosic waste materials
11.50-12.10	Creative & innovative learning and teaching within textile, leather and fashion sector
12.10-12.30	***Discussion***
12.30	*Creating me slowly* – exhibition

More about lectures……..

Introduction: Textile Science Research Centre today

Tanja PUŠIĆ

Textile Science Research Centre (TSRC) is operating in accordance with the research strategies of the University of Zagreb and the Faculty of Textile Technology. Through the activities of experts and researchers, TSRC is involved in European initiatives in the field of textiles and clothing, connected with a numerous institutions at home and abroad, participate in the creation of policy documents and initiatives. Innovative technologies and materials will be presented within TSRC Day 2016 - INNOVATIVE TEXTILES – Reality or Science Fiction.

TOPIC 1: Innovation in textile and clothing sector

Sandra BISCHOF

The highest number of innovations within the sectors of textile technologies, technical textiles and fashion originates from Europe. During the 2015, new research & innovation priorities, named *The Textile Flagships for Europe* are identified by EURATEX, enabling the fourth industrial revolution within the textile and clothing (T/C) sector. New Strategic Innovation and Research Agenda for T/C industry till 2025 is predicting positioning of our sector into the strategic one. Key trends and major end markets for textile products, so as the possibilities of knowledge transfer to various markets will be presented.

TOPIC 2: From skin to skin

Edita VUJASINOVIĆ
Marijana PAVUNC

After years of evolution, through numerous trial and error, nature has come to ingenious solutions that we can find all around us. The ability to bring the beauty of nature, economy and functionality, which are requirements on the modern textiles, is still unbeatable. Modern textile engineers and designers have recognised this and started to learn from nature. Although the design inspired by nature has existed for thousands of years, at the end of XX. century it entered through the front door in the magic world of textiles.

One of the first clothing, in the true sense of the word, was made of skin and fur, but today ....?, today skin and fur inspire new developments in textile materials which become universally present in our lives. Some of them even promote the spirit of the recent Olympic Games, the slogan "Citius, Altus, Fortius!" (Faster, higher, stronger!). By emulating the genius of nature on / in textiles, within research project ADVANCETEX, researchers create a new materialsa relying on biomimicry which manifests itself as a survival strategy as well as way towards a sustainable future, and not only in textiles.

TOPIC 3: Functional nanofibers – the product of the frontier technology of electrospinning

Emilija ZDRAVEVA

Among the many nanofibers producing technologies last decade leading position is taken by the very much popular technique of electrospinning. Because of its advantages such as: ease of lab device set-up, diversity in the usage of polymer and non-polymer compounds (e.g. metals, metal oxides, ceramics, biological molecules etc.), ability to control the fibers diameter and morphology, as well as their arrangement, this technique occupies the interests of various scientists around the world, and each year results in a vast number of innovations and improvements in the properties of the existing materials. The development of advanced electrospinning set-ups including: bi-component electrospinning, needleless electrospinning and electrospinning of nanoyarns, has set the beginnings of process industrialization due to its proven productivity increase. Finally, the greatest achievement is certainly related to the fields of application of electrospun materials including: the field of biomedicine (tissue engineering and drug and biological components delivery), energy storage, energy transformation, electronics (lithium-ion batteries, solar cells, piezoelectric devices, sensors), environmental protection, chemistry, functional textiles and others. Beside an overview discussion of the latest achievements in the electrospinning, this presentation will focus on the research of nanofibrous materials incorporating phase change compounds, such as: a mixture of vegetable oils and polycaprolactone, as a contribution to the field of passive thermal energy storage or functional thermo-regulating textiles. These materials exhibit stable form during solid-liquid transition at higher temperatures, encapsulation efficiency and reliability in the storage and release of heat. Additional stability is ensured by a thin layer of polypyrrole with a thermally conductive compound of graphene oxide. When one thinks of a temperature self-regulating material for the design of heat-protective clothing, its application truly becomes a reality primarily due to the extremely small mass that should be an imperative in such application.

TOPIC 4: Invisible colours

Ana SUTLOVIĆ
Antonela FULIR

Advanced technology and customer requirements dictate textile production focused on specialized products of high value and multifunctional textiles that meet the needs of the market. The constant development in the field of smart textiles allows access to new and innovative materials, the types of yarn, dyeing and other systems. Area of innovative textile implies the application of smart dyes too. Smart dyes have the capability of changing the coloration in the presence of temperature, acid, alkali, sunlight, water, mechanical load, the supply voltage and other stimuli occurring due to the different physico-chemical changes in the level of molecules. Significant possibilities of application of these dyes are related to the development of smart or intelligent textile materials (in the context of fashion, decorations, toys, camouflage clothing, thermoregulation and a variety of flexible sensors), which are capable of sensory stimuli of different nature, responding to the same and to adapt to new conditions. The intelligence of these compounds depends on their capacity to respond to external stimuli, which can be physical, chemical or mechanical.

The phenomenon of reversible or irreversible coloration changes called chromism. It is known that many natural compounds have the chromism property. In addition, a number of synthesized compounds have same properties. In most cases chromism based on the change of the electronic state of the molecule. Chromism induces a reversible colour change of the chemical compound, which includes changes such as chemical bonds or changes in molecular conformation. Thermochromism is a frequent occurrence chromism in which a change of coloration comes through the action of heat. Chemical bonds or changes in the molecular conformation of the chemical compounds of the influence of heat caused by the dynamic change of the optical state of thermochromic dyes from coloured to colourless, one can follow the occurrence of different absorption spectra. This phenomenon can be creatively used in textile design to create special effects, but it is useful when colour changing indicates the change in temperature in e.g. food packaging, medical thermography.

TOPIC 5: 3D flattening – application possibilities in clothing, footwear, automotive and furniture industry

Slavenka PETRAK
Maja MAHNIĆ NAGLIĆ

The development of new products models in modern industries that apply textile, leather or different kinds of alternative artificial materials in the process of prototypes design and modelling is based on the application of contemporary computer systems and advanced technologies. For many years, computer 3D design applying specialized CAD/CAM systems and automated technological manufacturing process are present in the various industries in which the finished products are assembled from the solid parts. Intense and continuous development of computer graphics and computer systems in the last decade enabled significant improvement of 3D product prototype design and development process even in clothing, footwear, automotive and furniture industries. Characteristics and great diversity of physical and mechanical properties of materials that in these industries are used for complete products production or for covering particular parts of the product, affects the complexity of computer 3D design and prototype testing application. In that sense, possibilities of computer 3D systems and technologies in 3D product design process, in which the cutting parts of textile or other material should be designed, to be

shaped to a final product or the construction of the solid model on which it will be applied, will be presented. Geometric 3D modelling enables construction of clothing cutting parts fully customized to the human body model, to segments of the computer 3D last in the process of computer footwear design or to solid 3D structure segments of the car seat or upholstered furniture. In all these cases, it is necessary to transform a 3D computer prototype in the 2D cutting parts so that they can be tailored from certain materials. Computer transformation of irregular 3D surfaces or transformation of 3D surfaces into 2D cutting parts is called 3D flattening, whereby a flattening results are cutting parts that correspond to the full 3D model of the body or solid models on which they are designed. The present concept can greatly contribute to accelerating the development and testing process of new model prototypes in these industries, increasing the quality of finished products and reduce costs resulting from the process of making real prototypes. Scientific research in this area, are also the subject of research carried out at the Department of Clothing Technology, Faculty of Textile Technology, University of Zagreb.

TOPIC 6: Innovative filters from cationized cellulosic waste materials

Anita TARBUK

The research of pure system has shown that cotton cationization during mercerization process results in improved material properties, primarily better adsorption properties because of change in material surface charge. It represents an exceptional potential for ecological wastewater treatment as such modified cotton adsorbs anionic surfactant and dyestuff in quite higher amounts. The textile and clothing industry, except from waste water, have textile waste form cut production and sewing process, as well as from regenerated cellulosic fiber production. Therefore, the main idea was to try to cationize waste cellulosic material in the same way and use it as a new material of added value. The filter would keep waste fibers that clog pumps and membranes, and additionally adsorb anionic compounds which burden textile waste waters. Since this is wide research, the researchers from the field of textile finishing, dyeing, care and waste water are gathered together to create prototype of such a filter. On such modified recycled cellulosic material the characterization by SEM microscopy, FTIR-ATR spectroscopy, degree of polymerization determination, and electrokinetic analysis – zeta potential and surface charge were performed. Afterwards, the sorption properties, with a focus on water uptake and adsorption of surfactants and dyestuffs were done. Achieved results on recycled and regenerate cellulosic materials showed high possibility for production of such filter. As for the process effectiveness is important to determine the preliminary process parameters in the model and more importantly, the real waste water, the prototype filter produced as needle punched non-woven, will try to be implement in the laboratory device (column) for wastewater treatment. The parameters of waste water before and after filtration will be analyzed in order to determine the possibility of its reuse in the process.

TOPIC 7: Creative and innovative learning and teaching the Educational sector for Fashion, Textile and Leather

Danijela PUSTAHIJA MUSULIN

The time that we live in has a specific relationship to teaching and learning. The concept of lifelong learning includes the fact that we learn every day through various forms of formal, non-formal and informal learning. Teachers who teach young people or adults are facing professional and methodological challenges of their time.

Devising teaching includes non - formal and informal forms of learning which, with

the formal forms, provide the adoption of learning outcomes required for the acquisition of sectoral qualification. To develop personal potentials of an individual, by including his or her interests and talents in teaching, is possible by respecting the non - formal and formal forms of learning. Creative and innovative learning and teaching is a response to new demands of the Educational sector for fashion, textile and leather, the needs of the individual, the community and the labor market. New techniques and technology have altered the nature of work and organisation of the economic sector of textile and leather. The technology involves a large amount of information and other content that promotes mental tasks that require creativity, innovation and ability to adapt to the workplace. Traditional mass industrial production in Croatia has been replaced by a specific small batches. The educational sector for fashion, textile and leather identifies a new type of knowledge, skills, values and attitudes that are expected in an individual in the labor market. The change in the ratio of production and employment conditions encouraged the development of new curricula with core and sectoral competencies. Basic knowledge and skills in the fashion sector are expected with innovation, creativity, problem solving, development of critical thinking, entrepreneurship, computer literacy, working on fashion projects, social and other skills. It is therefore necessary to introduce changes in the approach to teaching and learning which will, with its application and usage, provide space for lifelong learning and in that way acquire basic and sector competencies of the Educational sector for fashion, textile and leather which ensure the inclusion of the individual in the modern economy sectors, related or associated sectors and other users of fashion, textile and leather goods. On the basis of the European Qualifications Framework - EQF, the Croatian Qualifications Framework - HKO issued the recommendations for the development of new qualifications which, through the implementation in the curriculum, support the development of creative and innovative teaching and learning.

EXHIBITION: *Creating me slowly*

Marijana TKALEC

Globalization processes, transformation, conversions, fast production, the Internet generation and new technologies change the meaning and definition of design and designers in the 21st century. The result and consequence of fast fashion, fast production and fast design industries is design glut which eventually makes design ephemeral, treats it as nonusable, waste, useless and unwanted. This inevitably resulted in changes in human behaviour, dehumanization in design and hyper-fast changing world. In order to emphasis the significance of people's personalities when creating, manual skills as well as slow and sustainable design processes, three techniques have been used in this project; patchwork, handweaving and felting technique to create new, authentic products by the circular economy model.

EXIBITORS: