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UET TEXTILE MAGAZINE



DEPARTMENT OF
TEXTILE ENGINEERING
UET LAHORE, FAISALABAD CAMPUS





Prof. Dr. Syed Mansoor Sarwar

Vice-Chancellor UET Lahore

“University of Engineering and Technology (UET), Lahore, is celebrating 100 years of its academic excellence. During these years, the university has played a key role in the development of engineering sector in Pakistan. The textile sector is the backbone of Pakistan’s economy and Department of Textile Engineering, UET Lahore, Faisalabad Campus, has been putting its best efforts to support the textile academia and industry of the country for many years. “UET Textile Magazine” is another such effort by the department. Creative thinking and writing are essential for success in today’s challenging world and this magazine provides a great opportunity to the magazine team and the department to polish such skills. To make this magazine a constant source of guidance and inspiration for academics, students, practitioners, and public at large, the work done by the team of the UET Textile Magazine is indeed worthy of appreciation. Their efforts should certainly serve as a source of motivation for other departments at the UET to initiate similar activities.”

Kudos to the magazine team!



Prof. Dr. Nadeem Ahmad Mufti

Dean Faculty of Mechanical Engineering

Department of Textile Engineering is an important department in the Faculty of Mechanical Engineering of UET. Department has taken number of initiatives to support the crucial and pivotal sector of textile in Pakistan economy. I am gratified to know that the Department of Textile Engineering is bringing out the first issue of their magazine “UET Textile Magazine”. This is a productive technical material and subsidiary skill developing tool for the students and professionals. I also applaud the coordination and efforts behind the team to bring out this issue. I wish them all success.



Prof. Dr. Muhammad Mohsin

Chairmen Textile Engineering Department

“It is with profound pleasure, humility, and anticipation that Department of Textile Engineering is launching its annual “UET Textile Magazine” and I am sure it will serve as another great initiative from the Textile Engineering Department for the textile community and industry. I anticipate that “UET Textile Magazine” will be of interest to readers and authors working in all areas of textile. I would like to acknowledge the services and dedication of the “Magazine Design Team” and all the article contributors. I would like to particularly thank Eng. Khurram Shehzad, Chief Editor (Faculty), Mr. Ali Asadullah, Chief Editor (Student) and most importantly Dr. Shaheen Sardar for their technical support in issuance of this magazine issue.”

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Brief introduction of UET Textile Engineering Department

The department started functioning in 2013 with highly qualified and experienced faculty, staff and well-equipped dedicated laboratories. There are more than 120 lab scale equipment installed at the department of textile engineering in its 12 labs. The graduates of the textile department are currently working in some of the top textile mills of the country like Nishat, Sapphire, Interloop, Crescent, Ibrahim Fibers, Azgard 9, Sadaqat, Master, Masood, CBL, Cotton web, Kamal, TTI and US denim.

Since last four years (2018, 2019, 2020 & 2021) department of textile engineering has organized three mega events of textile annually (1st, 2nd, 3rd & 4th International Conference on Sustainable Textile, SDC-UK textile design competition for students (Pakistan chapter) & All Pakistan textile brands exhibition) for the first time in Pakistan which was attended by more than 1000 textile industry and university participants.

The textile sector in Pakistan has an overwhelming impact on the economy, contributing 60% to the country's exports and 46% of the total industrial production. This sector also provides employment opportunities to 45% of country's workforce, which is one of the highest. In today's highly competitive global Environment, the textile sector needs to upgrade its supply chain, improve productivity, sustainability and maximize the value addition to be able to survive. It cannot be thought of without competent professionals in the relative field. UET's Faisalabad campus is privileged over other campuses of UET for holding a degree awarding department in Textile Engineering field. The following three-degree programs are being offered at department of textile engineering,

i)- BSc Textile Engineering

ii)- MSc Textile and Materials Engineering

iii)- PhD Textile Engineering

B.Sc. Textile Engineering course is based on Outcome Based Education (OBE) and accredited by PEC under level-2 (Washington Accord based).

The course of study is the composite one and cover all five sections of textile. Below are the textile specializations which every student of department of textile engineering studied during his/her degree duration.

1. Spinning (Yarn Manufacturing)
2. Weaving (Fabric Manufacturing)
3. Knitting (Fabric Manufacturing)
4. Wet Processing
5. Garment Manufacturing

MSc Textile and Materials Engineering

Department started offering MSc Textile and Materials Engineering since 2020. It is one of the unique MS programs of the country which aims at bringing the students abreast with the most recent developments in Textile and Materials Engineering by enhancing their analytical skills and research capabilities. The program aims at preparing the graduates for careers in R&D, teaching, management of academia, government and industry. Paid RA positions for MS students are also available.

PhD Textile Engineering

Department started offering PhD Textile Engineering since 2021, thus making it among very few textile departments of Pakistan to offer the highest degree in textile engineering. The program aims at producing the PhD graduates with the attributes of innovation, scientific research and development coupled with advanced analytical skills in the field of textile engineering. The program will develop highly qualified professionals with the abilities to perform leading and advanced scientific research for the uplift of textile industry of Pakistan as well as to enhance the quality of textile related research at academic institutes. UET has adopted the HEC initiative of allowing PhD enrollment after 16 years BSc, while for candidates having MS degree their credit hours will be adjusted in the PhD program. In addition, UET has started a great initiative of full tuition fee waiver for full time PhD students and possible stipend after approval of thesis topic.

Some Glimpse of State of Art Labs of Textile Engineering Department



Mini Spinning Lab



Pilot Spinning Lab



Weaving Preparatory Lab



Weaving & Knitting Lab



Advance Weaving Lab



Dyeing & Finishing Lab



Textile Wet Processing
Research Lab



Textile Pattern Lab



Garment Lab



Textile Testing Lab



Textile Recycling Research Lab



SEM Lab

Annual International Conference on Sustainable Textiles

Organized by Department of Textile Engineering since 2018

1st international conference on sustainable textile 2018 was organized by department of textile engineering. In which many foreigners including Mr. Paul Cowell (Archroma global head of business development), industrial experts and researchers participated. SDC-UK Student textile design competition (Pak region) and Top Pakistani textile brands exhibition were also conducted along with international conference in which more than 200 students and different brands participated.

1st Conference 2018



2nd international conference on sustainable textile 2019 was organized by textile engineering department. Over 1000 visitors including textile companies' owners, CEOs, industrial managers, and students attended the conference. Mr. Mujtaba Rahim (CEO, Archroma), SDC-UK Technical Director, Mr. Ignasi Cubina (Director, EIG C2C Spain), Ms. Aglaia Gomez (Consultant, EIG C2C Spain) as well as other top experts of the textile field have shared their knowledge at the international conference.

2nd Conference 2019



3rd international conference on sustainable textile 2020 was organized by department of textile engineering. Ms. Sussen Margaret Bolt (President, SDC-UK), Mr. Karl Borgschulze (MD, CSI) and Ms. Shelley Andree (Education & Engagement head, SDC-UK) along with other experts shared their thoughts in the conference. SDC-UK Student design competition (Pak-region) and Top Pakistani textile brands exhibition were also conducted along with international conference in which more than 450 students and different brands participated.

3rd Conference 2020



4th international conference on sustainable textile 2021 were held online due to pandemic of corona virus on 19th May 2021. Different scholars, researchers, scientist, industry representative and students attended this online conference. More than 20 international speakers gave their presentations on recent trends and issues of textile industry. Topics of the technical talks cover production of sustainable raw material for textile industry, textile sustainability, wastewater treatment solutions, Textile chemical waste and ZDHC etc.

4th Conference 2021



Abstract of the Technical Lectures Delivered at 4th International Conference on Sustainable Textile



Prof. Dr. Chris Carr

Professor of Textile Technology,
School of Design, University of
Leeds, UK

Designing fashion clothing for recycling-The stability of colorants and finishes

The clothing and textile industry is one of the biggest contributors to landfills and affecting the world environment. Today, fashion industry is huge in terms of global business contribution. Despite its popularity, it also has a gloomy character involved, where pressure is to reduce cost, toxic chemicals, dyes used, textile waste, and overconsumption of energy. This study presents that how we can reduce textile waste, water, and energy by using the Dry-Dye method on Recycled polyester derived from PET bottles. The research base is to convey attention to the modest fashion customers as the material created by these innovations best suits their necessity, remembering their wellbeing and advantages to the worldwide condition and the clothes

are being designed for reuse, resave and recycle.

According to previous studies the application of crosslinking dyes and easy-care finishes to cotton can significantly reduce the dissolution of waste cotton and limit potential recycling of cellulosic materials. About 10.5 million tons of textile waste was landfilled in 2015. By 2030, it will increase by 60%. Solution of the problem is closing the loop by recycling it through sorting and grading. This can be done by regenerating the new fibers and textiles from these new fibers.



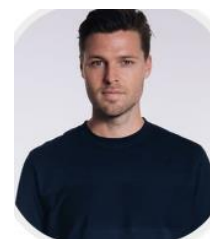
Prof. Dae Ho Yoon

School of Advanced Materials
Science & Engineering,
Sungkyunkwan University, South
Korea

Sustainable materials synthesis and their dynamic applications in textile and renewable energy generation

Sustainability is the process to live within the limits of available resources, recycling and reuse the natural resources. By doing this the world can be saved from the crisis.

Sustainability depends on environmental, economic, and social aspects. Evaluating the environmental sustainability for textile products has been difficult, because of the complexity in the production and consumption processes. To promote sustainability, renewable energy materials, green lead-free perovskite luminescence, efficient yet sustainable digital printing, and functional textiles are generated. Copper synthesis which involves the utilization of toxic chemicals is replaced by green synthesis of copper nanoparticles. This revolution has diverse applications ranging from electronics to disinfectants.



Mr. Koen Warmerdam

Brand Director, Aware,
Netherlands

Aware: An Introduction 2021

Mr. Koen launched 2 brands and has more than 10 years of experience in the textile industry. One of the objectives of the brand; Aware is to lower the human influence on the environment by supporting the implementation of sustainability in

textile industry. The textile industry works with various verification methods, to assure the good quality of the fabric. Aware developed a rock-solid technology that can truly verify the authenticity of recycled materials. It is a constituent brand, registered a “digital twin” yarn in block-chain to produce garments.



Mr. Victor Guo

CEO, Zhejiang Lanyu Digital Technology Co. Ltd., China

**Industrial Textile Inkjet Printing
The two sides of sustainability**

Inkjet printing is the two sides of sustainability (Environment and Business), whose estimated share in the market is 10% of the conventional printing. Environment sustainability refers to the less usage of chemicals, water, and energy, whereas the business sustainability means the economical profit and growth by providing best value to the customers. The technology provided by the Lanyu digital not only gives the full range of inks for the textile industry but also provides certified reliability and efficient customer care. The future of the technology goes ahead to dry processing requiring zero water consumption and use of new

technologies collectively to maximize ultra-efficient processing. Sustainability is a broad discipline, giving students and graduates insights into most aspects of the human world from technology to environment and the social sciences. Textile sustainability is a global challenge and it’s becoming more difficult to meet the everstrict sustainability standards



Dr. Syed Naveed Rizvi

George Brown, Canada

Research @ GBC

Light is reflected from most surfaces by two simultaneous processes, known as specular (or surface) reflection and diffuse (or body) reflection. The specular reflection creates the highlight as its most conspicuous expression. In specular reflection, light bounces according to the rule that the angle of incidence equals the angle of reflection. On any shiny object, we see the highlight, or specular reflection of the light source. This reflection is at the point where the surface is at just the angle needed to bounce light from the light source to our eye. Usually, in conventional method shine band is considered and then diffuse reflectance. After that, a ratio is calculated, and at the last human perception is processed.

But at George brown findings are slightly different than as above explained. The reflectance is divided into 2 parts; Chroma specular and Chroma diffuse and it has exhibited interested results.



Mr. Sohail Ali Naqvi

Manager, Freshwater Program, WWF Pakistan

Sustainable solutions for the revival of Textile sector in Pakistan

The mission of WWF is to stop degradation of the planet and natural resources. Textile sector in Pakistan has contributed largely in terms of exports, GDP and 45% of total employment in the country. Constant upgradation of national and international laws and standards, conventional business, and resources utilization are the challenges in the textile sector of Pakistan. We can promote sustainability in the textile businesses by three ways. First is the potential of recycling in textile sector of Pakistan in terms of findings of recycled fabric, the potential of CO₂ emission reduction by recycling, and textile wastes management hierarchy. Second is sustainable environmental management practices. While third is technical

textile potential in Pakistan. As a recommendation, sustainability of textile business and recycling of the textile waste is a good option for reducing the footprint as well as for the sustainability of the textile material.



Dr Mattia Bartoli

Center for Sustainable Future Technologies - CSFT, Torino, Italy

Use of textile waste-streams for the production of fibrous biochar

At present, high tech carbon fibers provide electrical, mechanical, and optical properties. Which are highly useable in modern technology (aerospace, spaceships, space shuttles) but has difficulty in production and material cost. We are compelled to find out sustainable solution for its manufacturing. The world is thinking about sustainability, bio char fibers have remarkable properties like above one. Here, bio char fibers are obtained from waste textiles streams using pyrolysis, after forming a polymeric composite give a high temperature to obtain a well geometry shape which is suitable for electrical properties. These properties are valuable for forming LIBs.



Prof. Dr. Hany Abou Ahmed

Professor, National Research Centre, Egypt

Nano Technology Applications in Textile Wet Processing

The nanotechnology has allowed the textiles to become multifunctional and produce fabrics with special functions like UV protection, easy clean, water and stain repellent and anti-odour. Four methods were used for the preparation of nanoparticles (Physical method, Chemical method, Sol-gel process, Biological process). There are certain performances which can be achieved through textile wet processing by modified nano sol-gel and it can include water-oil and soil repellence, UV protective, antimicrobial properties, controlled release of oils and flavours, decreased inflammation, bio catalytic properties, bio compatible properties, improved abrasion stability, improved dyeing and electrical conductivity.

In Nanotech UV protective finishing fabrics became UV radiation repellent. The protection from UV was depending upon construction of fabric, dyeing and such finishes which absorb UV. When straight light falls onto the textile fabric, some part of light was reflected, some was absorbed by the material

and the remaining part was transmitted from fabric. Nano structured antimicrobial agents was classified into two groups. Inorganic Nano structured materials and their nano composites are TiO₂, Ag, Au, ZnO, Cu, CNT, Clay, Ga. Inorganic Nano-structured loaded into organic carriers. TiO₂ nanoparticles have unique properties such as high stability. Nanoparticles applicable in many fields such as self-clearing, antibacterial agents, UV protection agents, Environmental air and water purification gas sensors and high efficiency solar cell.



Dr. M. Faizul Yahya

Head of Strategic Planning, University Technology Mara, Malaysia

Finite element analysis (FEA) framework for textile structures simulations

The finite element analysis (FEA) is extensively used in aerospace industry. FEA is numeric method for solving problems of engineering. According to this approach, we will break the big square into a smaller ones and try to manage them individually. It has many common FEA applications in different fields e.g., mechanical, aerospace, civil, automotive engineering, structural.

FEA is used in many different textile models e.g., woven fabric tensile and Impact model CAD, woven composite model CAD. It is also very useful for fourth industrial revolution and sustainable textiles.



Mr. Hamed K. Lateef

Founder and CEO, TTI Testing Laboratories
Textile sustainability and importance of testing

Today, sustainability has taken an important shape in the world. Companies would improve their sustainable development of products to save their resources. In the last 26 years, the companies had shifted their simple textile testing to most complex textile testing to meet the expectations of buyers and had sustainable partnership with 5000 factories and 150 global buyers. Factories has their certain sustainable goals. There were four basic steps for sustainability approach. First of all, they need to know the toxicology of all the chemicals being used. Industry had to reduce wastages to improve their products. Secondly, industry could also approach sustainability by understanding people and environmental impact of input and outputs. Third one is that products

and materials are changing. So, they would invest in developing alternative raw materials, recycling, and circular fashion. how they could improve their products. In this way they could better understand their products and improve them. So more buyers will buy their products. The last point is to select the right stack holders and right doctors to know right diagnostic laboratory at right place. They need to have a qualified and experienced team that will guide them about the report and how they could improve their products. In this way they could better understand their products and improve them. So, more buyers will buy their products.



Dr. Shahid Rasul

Senior Lecturer, PI-Texonomy, North Umbria University, UK
Textile circular economy: From Pakistan's perspective

Pakistan's textile sector is one of the economy leading sectors of Pakistan. Textile industry is achieving many of their goals in textile in Pakistan as well as ease of doing business. Pakistan also faces the global risk index as climate change or drought. Circulatory designs make the situation environmentally friendly and long-lasting. Achieving some barriers has



Dr. Alberto Tagliaferro

Department of Applied Sciences and Technology, Politecnico di Torino, Italy

Raman spectroscopy: a non-destructive tool for the investigation of textiles

Carbon group of Politecnico di Torino is considered as "specialist for bio char emerging applications" in 2020. Basically, Bio char is a product of treatment to various waste feedstocks, and it improves the electrical conductivity. Raman Spectra are generally rebutted to temperature changes. It is non-destructive and highly specific technique. Improvement of basic elements and working on spectra in textiles are the basic requirements. The use of raman in textile is gaining more momentum because it can be useful tool in identifying both textiles and dyes. It can also be helpful for checking the fiber quality and crystallinity. This will allow placing raman spectrometer in line production plants, generating prompt feedback on the textile quality. approached circular designs. Incentives are also an important factor in Pakistan's textile circular economy. Taxonomy has to offer resources of better productivity in a circular system.



Dr. Fenglei Zhou

Senior Researcher, University College London, UK

Co-electrospinning of brain-mimicking polymer materials for diffusion magnetic resonance imaging

Co-electro spinning of brain mimicking polymer material for different magnetic resonance imaging was the theme for developing maneuver of brain in advanced studies. The tools of studies involve brain white matters mimicking phantoms. A more advanced approach “non-invasive” by depending upon the two parameters of water solubility diffusion criteria of different tissues. The one is the apparent diffusivity coefficient and other is the fractional anisotropy. The key point makes a widespread way of diagnostic approach as markers detectors of disease approach tool, with ways of localization and treatment, all used in brain, heart. Different ways of approaching (calibration) in batter quality and announce of MRI (Magnetic Resonance Imaging) techniques in microstructural photons in longitudinal and multi-center studies makes microstructure imaging techniques in a better way

of accomplishment. The best core technology in co-axial electro spinning, which involves core solution pumping, shell solution pumping with DC high voltage in a collective way of fiber collector system towards co-axial spinneret. The co-axial electro spinning scheme having spendable shell material involves PCL and core spinnable material involves polymers or non-polymers. Co-electro spinning of hollow microfibers involves (0.4 μm, 4μm and 12μm) the diameter variability and type of core/ shell material.



Mr. Wolfgang Hohn

CEO Hoehn Textile Engineering, Germany

Effluent treatment in the textile industry

The textile industry is one of the most waste-water intensive industries. An efficient waste-water management in textile industry can be achieved in a well-organized company with optimized methods of effluent waste-water recycling. Its average cost is 10% of the total cost. Effluent discharges have two types including direct discharge and indirect discharge. Effluent impact by textile industry differentiated by the substrate.

In most countries, the discharge of wastewater is legally controlled to certain predefined levels. The effluent management in textile industry includes effluent treatment plant. Ideal concept for wastewater management is that the cost of running would be minimum but at the same time there must be the maximum saving of resources.



Prof. Dr. Elsayed Ahmad Elnashar

Ex-Dean & current Professor of Textiles & Apparel, Kaferelsheikh University, Egypt

Sustainable Materials Synthesis and their Dynamic Applications in Textile and Renewable Energy Generation

Sustainable Textile industries in Brand Technology between Technologies of production brands. The technology industry thrives on change, requiring constant experimentation and innovation, and determining new entries in highly saturated markets. While to stimulate customer loyalty and differentiate from competitors, tech brands strive to continually deliver technology software update of textiles, communicate novel use cases or launch new systems of textiles Technology and brands.

It needs to be understood that strategic tech company branding, and marketing can help your company generate a competitive advantage in this fast-moving space.



Prof. Dr. Ozan Avinc

Head of Department of Textile science, Pamukkale University, Turkey

Some Common Issues in Sustainable Textile Production

Sustainability in textiles like natural dyes and fiber printing, textile finishing, and functional performances are prominent issues that need to be emphasized. There is huge world consumption of fashion trends hence clean water and energy resources are decreasing and that results in harmful environmental effects. Sustainability, the continuity of diversity has become one of the biggest problems in the textile industry and indeed it is indispensable element of today's production work from ecology point of view. The solution is the process of sustainable raw material selection for textile product and environmentally conscious design manufacturing in textile production. It includes the selection and use of sustainable, renewable and biodegradable textile materials.

Reusability, recyclability and the use of new eco finishing techniques are leading to lower water consumption, energy and chemicals. Hence, we can use natural or vegetable based substances instead of synthetic chemicals that will present sustainable solution and overcome possible negative effects on environment and can lead to sustainable future by responsible manufacture. Eco conscious textile material selection and production are vital as organic natural fibers remove the risk of damage to the health caused by chemical residues. There are some physical, chemical, environmental and mechanical properties that needs to be kept in mind and some key features like processibility, biodegradability and cost are main the parameters being effective in material selection. Such factors can change the magnitude. Bio fibers are mainly produced from bio polymers. Natural polysaccharides and bio polymers are based on cellulose, alginate, wool, silk, chitin and soybean. Synthetic polymers like PLA [POLYLACTIC ACID], PCL and PET are produced by microorganisms PHB. Increasing the diversity of biodegradable sustainable fibers produced from renewable sources have become one of the primary goals of the researches to meet this need. Many eco-friendly technologies recently introduced in textile production can minimize wastewater, workload, processing time, energy and clean water saving during textile production.



Dr. Nazmul Karim

Centre for Fine Print Research, University of the West of England, UK

Multi-Functional Graphene based Wearable E-Textiles

Wearable E-Textiles are getting more and more popular nowadays. Multi-functional graphene and bio sensors are a real boost for E-Textile. One of the biggest feature applications is the use of bio sensors in medical. Recently various groups have investigated the use of variable sensors to predict COVID-19 symptoms. They develop a device that can monitor vital parameters such as temperature, heat monitoring and oxygen levels. There are also many other medical applications. The biggest challenge is the textile raw material itself because it is rough and porous, elastic and flexible, heat sensitive and It has limited compatibility with solvents. On the other hand, majority of the inks are non-environmentally friendly, non-biodegradable, requires high temperature, complex manufacturing process and exhibit poor washability and durability. A single layer of graphite and if we imagine graphite 3d structure, or if we break it down into 2d structure and into a single layer then it becomes graphene.

Glimpse of the Events Organized by Department of Textile Engineering in 2021

General Manager Ahmad Jamal Textile Mills visited Department of Textile Engineering

Mr. Saif ul Islam (General Manager) Ahmad Jamal Textile Mill, visited Department of Textile Engineering, UET Lahore, Faisalabad Campus.



He visited various labs & other facilities available at department and shown keen interest in projects led by the faculty of textile department. He also offered the opportunity of industrial projects to students of textile department. It was agreed to further strengthen the collaboration of UET's textile department and Ahmad Jamal Textile Mill. (21-12-2021)

A seminar on "How to achieve sustainability and ZDHC for textile industry"

A seminar on "How to achieve sustainability and ZDHC for textile industry" was successfully conducted at UET's department of textile engineering. It was one of the activities/trainings organized by the "Textile Sustainability Working Group".(21-12-2021)



More than 120 representatives from textile industry and academia attended the seminar, including more than 50 representatives from textile industry. (8-12-21)

Seminar on OBE & CQI effective implementation

A Seminar on OBE & CQI implementation was conducted for Faculty of UET Lahore, Faisalabad Campus. Resource person for this seminar was Dr. Muhammad Mohsin, (OBE committee convener and Chairman, Department of Textile Engineering, UET Lahore-Faisalabad campus).



Lecture and Interactive session was also carried out which was very useful for the faculty of UET Lahore, Faisalabad Campus. This seminar was part of the every semester seminar held for the campus faculty on OBE.

Inauguration of Pakistan's 1st "Textile Recycling Research Lab"

Pakistan's 1st and most comprehensive "Textile Recycling Research Lab" was established at Department of Textile Engineering, UET Lahore, Faisalabad Campus. It was inaugurated by General Manager of NSR textile mill on 8-7-2021. These set of labs have the capacity to convert the textile process and post-consumer waste into recycle yarn, fabric and end product. In addition, it has the unique capability to convert any textile and its blend waste into value added carbon black, composites, conductive inks and bio oil as source of energy etc. Active research is now being carried out in collaboration with the industry in these labs. Soon this lab will be upgraded with latest equipment as purchase order of the equipment have been issued. This will further strengthen the research capability of this lab and department.



Interloop R & D Team Visited Textile Engineering department

Interloop limited has officially joined the unique and innovative project related to textile recycling which is being carried out at "department of textile engineering, UET Lahore, Faisalabad campus.



Team from Interloop also visited the "textile recycling research Lab" of the department on 5-8-2021. Technical discussions were carried out and number of collaboration opportunities were discussed. Many more textile industries are showing interest and going to join this wonderful recycling initiative.

Other Events Organized by Textile Engineering Department in 2021

1. Event in the remembrance of APS Peshawar (16-12-2021)
2. Orientation for B.Sc. Textile Engineering batch-2021 (15-12-2021)
3. Industrial visit to Nishat Textile Feroze Watwan for B.Sc. Textile Engineering batch'18 & 19 (26-11-2021)
4. Welcome party for batch-2020 (27-10-2021)
5. Industrial visit to Sapphire unit # 6 & 9 for B.Sc. Textile Engineering batch-2019 and 2020 (20-10-2021)
6. Masood Textile Mills limited GM Processing and Garment Processing visit to Department of Textile Engineering (19-10-2021)
7. INNOTEX (Innovation in Textile) a society of Textile Engineers Handing over ceremony (6-10-2021)
8. Recruitment drive for MS Textile, MS/BS electrical and MS/BS Mechatronic by Sadaqat Textile Ltd at Department of Textile Engineering, UET Lahore, Faisalabad campus. (05-10-2021)
9. Team of Crescent Bahuman Limited (CBL) visited UET Department of Textile Engineering. (17-8-2021)
10. "Training Room" (on-site & online) has been established for "Textile Sustainability Working Group" at Department of Textile Engineering, UET Lahore (Faisalabad Campus). (06-07-2021)
11. Farewell party was arranged for the Textile Engineering session 2017. (02-07-2021)
12. A cake cutting ceremony was arranged at "Department of Textile Engineering" on 100 years of academic excellence of UET. (01-07-2021)
13. Project exhibition at UET's Department of Textile Engineering. (04-11-2021)
14. Visit and recruitment drive from Masood Textile Mills (pvt.) Limited at Department of Textile Engineering. (05-03-2021)

Glimpse of the Past Events Organized by Department of Textile Engineering Flashback of 2019-2020

Community Service; Antimicrobial and Antiviral Viral Face mask & Full-body protective suit Donation to Hospitals and Punjab Government during COVID Lockdown



To combat the spread of COVID-19, Department of Textile Engineering University of Engineering and Technology Lahore Faisalabad Campus (UET-FSD) developed cost and performance effective bio based (metal free) anti-bacterial and anti-viral facemasks under the supervision of worthy Vice Chancellor Prof. Dr. Syed Mansoor Sarwar. The project lead scientist was Prof. Dr. Muhammad Mohsin, Chairman, Department of Textile Engineering, UET-FSD campus including team members Mr. Shakeel and Mr. Imran Shahid. All the development and testing steps of the whole project were carried out at the state of the art lab facilities of UET textile department. The whole team worked tirelessly on this project despite the holidays due to lockdown at the university and completed the project in record 8 days. In addition, it was very difficult to arrange the raw material during the lockdown (April 2020) due to acute shortage of the items at that time. It was the first time that 100% bio based anti-microbial face mask and full body protective suit is developed in cost effective way in Pakistan. Testing of the treated anti-viral mask from the ISO certified lab demonstrated the "Full Effect" which is the highest rating possible. UET has donated 5000 anti-viral mask and 160 full body protective suit to the various hospitals and Punjab Governor (which distributed them to the front line doctors). (13-04-2020)

Training on ZDHC for Textile Industry

A training session was jointly organized by WWF-Pakistan & Department of Textile Engineering, UET Lahore, Faisalabad Campus. (11-02-2020)



This training was part of the efforts made by the department to achieve the sustainability in the textile industry of the country. It was attended by around 40 representatives from the industry.

Expert Lecture by Mr. Lukas Rebentisch

Mr. Lukas Rebentisch (Director Project Manager, Sustainable Pakistan, Consulting Service International Ltd.) visited Department of Textile Engineering and gave a lecture to the students (06-02-2020)

Expert Lecture by Mr. Waheed

Mr. Waheed Raamay (President, Council of Loom Owners Association) visited the department and delivered a lecture to students of Department (03-02-2020)

Lecture about Emerging Technologies for Sustainable Textile Wet Processing by Prof Long Lin

Professor Long Lin is the head of department of Color science and director of center of industrial collaboration, University of Leeds, UK. INNO TEX Society organized Technical Lecture for the students. He explained emerging technologies for Sustainable Textile Wet Processing specially digital printing. Students gained fruitful knowledge of the relevant topic and the session

proved very useful in enhancing technical knowledge. (13-12-2019)



Expert Lecture by Dr. Shafiq Ahmad

Dr. Shafiq Ahmad (Country Manager, Better Cotton Initiative) delivered a lecture to students and faculty members of Department related to BCI (12-12-2019)

Industrial lecture by GM of Sapphire Mills

Sharing of knowledge related to industrial experience and exposure is extremely useful for university students. A lecture was given by Engr. Raja Wajid Latif (General Manager, Sapphire Fibres Limited) at the Department of Textile engineering. (01-12-2019)

Industrial lecture by GM of Kamal textile

GM of Kamal textile interacted with student of textile department and delivered a technical lecture to the students at the Department of Textile Engineering

Requirements for OBE based Accreditation

A seminar was arranged for the faculty of the UET Lahore, Faisalabad Campus on the Topic of "Requirements for OBE based accreditation" by Dr. Muhammad Mohsin, (PEC-OBE based program evaluator), Chairman Department of Textile Engineering, UET Lahore-Faisalabad campus. This training is organized in seminar hall of main admin block of UET Lahore, Faisalabad campus. (14-10-2020)

Industrial lecture by GM of Samad textile

INNOTEX Society organized a technical lecture of General manager of samad textile for student of textile engineering department.

Interactive session with CEO of Kay & Emms

Dr. Khurram Tariq (CEO, Kay & Emms - pvt Ltd.) visited Department of Textile Engineering and had an interactive session with the students of B.Sc. Textile Engineering. (12-02-2020)



A Seminar on "Mental Health for All" by the DHQ Team of Experts

Technical seminar, cake cutting, and walk were organized on the topic of "Mental Health for All" at Department of Textile Engineering, UET Lahore, FSD Campus. Guest Speaker of the seminar was Dr. Imtiaz Ahmad (Head, Department of Psychiatry & behavioral sciences, DHQ Faisalabad). Student queries related to above topic were answered by the panel of experts which include Dr. Imtiaz Ahmad, Dr. Iram Saddiq, Dr. Nighat, Ms. Samreen and Ms. Qurat ul Ain Malik. Department thanked the organizers (Dr. Imtiaz Ahmad and Ms. Qurat ul Ain Malik) from the DHQ side for this seminar. (21-10-2020)

Other Events (Flash Back)

1. Plantaion drive and competition (19-11-2020)
2. Orientation for B.Sc. Textile Engineering batch-2020 (10-10-2020)
3. Welcom party for B.Sc. Textile Engineering batch-2019 (12-04-2020)
4. Farewell party for B. Sc. Textile Engineering batch-2016 (03-04-2020)
5. Faculty and Industry representative Training on "Facile & Sustainable Engineering" by Dr. Usama Bin Humayoun (03-12-2019)
6. Faculty and Industry representative Training on "Carbon from recycled cotton and plastic waste for industrial applications" by Dr. Aamer Abbas (11-12-2018)



Dr. Shaheen Sardar

Assistant Professor, Textile engineering department, UET
Lahore, Faisalabad Campus

Renewable Energy Integration In The Textile Industry Of Pakistan

Introduction

Textile supply chain has a complex structure, which requires the considerable use of energy at each stage. Usually, these energy requirements are fulfilled with the fossil fuels, resulting in issues such as considerable emissions of carbon dioxide, depletion of fossil fuels, increase in fuel prices, customer dissatisfaction, and the loss of global competitiveness. Most effective way to resolve these issues is the integration of renewable energy in the textile power systems and production processes. This articles explores the possible ways to integrate the renewable energy resources in the different stages of textile supply chain.

Energy scenario of Pakistan

Pakistan fulfills approximately 95% of its energy and electricity needs with the non-renewable resources such

as oil, natural gas, coal, and nuclear energy leading to the emissions of the greenhouse gases in the global environment. Textile industry releases up to 10% of the total carbon dioxide in the world [1]. The non-renewable resources are depleting rapidly, which may result in energy shortage in the country. On the other hand, Pakistan has a potential to generate endless energy from the renewable energy resources such as solar, wind, hydro, biomass, and geothermal energy. Specially, the wind and solar energy resources could fulfill the whole energy demand of Pakistan for thousands of years. The utilization of the renewable energy resources would provide the various benefits such as the significant reduction of carbon dioxide emissions, health protection, and less dependence on the costly fossil fuels.

Existing energy resources in the textile industry of Pakistan

Currently, Pakistan is supplying the non-renewable energy and power to the textile industry. Textile industry has the four key divisions including spinning, weaving/knitting, processing, and garments/end product manufacturing. These divisions use a great number of complex machines that require the great amounts of power and heat energy. For instance, spinning divisions consumes approximately 34% of the total energy of the above mentioned four divisions. Similarly, weaving/knitting consumes 21% energy, textile processing processes consume 35% energy, and the garment/end product manufacturing requires 10% energy. Spinning, weaving, and sewing divisions use substantial electrical power for operating machinery, lighting, cooling, and office equipment [2]. In contrast, textile wet processing requires the more energy for heating. For this purpose, most of the textile industry in Pakistan uses the electric heaters and natural gas. In addition, the grid electricity is also based on fossil fuels. Many factories are producing their own electricity and heat using fossil fuels. Many companies cannot afford their own electricity generation, which would result in the closing of factories and unemployment in the country [3]. Consequently, the integration of renewable energy

resources would eliminate the energy shortage in addition to the reduction of carbon dioxide emissions in the global environment.

The integration of renewable energy in the textile industry

The integration of the renewable energy in the national grid needs more time, strong infrastructure, latest technologies, more investment, and motivation. Meanwhile, the textile industry of Pakistan can generate its own electricity and energy through the utilization of renewable energy resources and technologies. It has been recommended that the combination of electricity and thermal energy should be maintained using renewable resources. It is evident that the renewable energy resources may provide more economic benefits compared with fossil fuels [4]. Many textile companies in the world are using the renewable energy resources in the manufacturing. For instance, a clothing company in Germany, namely continental clothing, has decreased its CO₂ emissions by 90% through the utilization of renewable energy and renewable raw materials [5]. However, textile industry in Pakistan is still using non-renewable energy and electricity due to its higher initial costs and the lack of skills to implement these technologies.

Most of the textile industry is located in the areas where a great amount of solar energy is available [3]. In these areas, solar photovoltaic systems can be used to produce electricity for spinning, weaving, and garment machinery. In addition, the textile processing processes consume a substantial energy for water heating. This water heating can be performed using the solar thermal energy. Temperature requirements in the textile processing processes ranges between 40 °C and 150 °C. Solar thermal collectors offer a temperature range between less than 50°C to greater than 1200°C [6]. Recently available solar collectors can cover 90% of the total heat requirements in the textile processing. For instance, flat plate collectors can provide heat for low temperature processes, washing, and dyeing. Concentrated solar thermal collectors can be used for the various processes such as starch preparation, drying, and curing of fabric.

Concentrated solar power collectors can be used for the electricity generation.

In addition to solar energy, the textile industry can estimate their potential to produce electricity with wind turbines, small hydropower, and biomass [7]. The existing literature recommends the textile industry to use the biomass energy in the electricity generation and heating. Textile industry generates large amounts wastes from cotton harvesting to post-consumer stages. These wastes can be used to produce bioelectricity, biodiesel, biogas, and bio-alcohol using relevant technology. For instance, Microbial fuel cells technology can be used to generate electricity from textile bio-wastes in addition to wastewater treatment [8-10].

The old textile buildings can be improved to accommodate possible renewable energy technologies. The new textile buildings should be constructed to accommodate renewable energy such as solar and wind energy. Moreover, the new textile machinery should be compatible with renewable energy resource. Besides, there are some solar powered machines in the market, which may be considered for small scale and rural areas. For instance, solar-powered mini ring spinning machine [11], solar textile looms [12], solar powered sewing machines [13]. Furthermore, electric vehicles based on renewable energy storage can be encouraged in the textile industry.

Concluding remarks

Textile industry in Pakistan has an opportunity to increase its global competitiveness through the utilization of renewable energy based heat and electricity. For this purpose, the solar, wind, small hydropower, and biomass energy resources can be integrated in the energy systems of the textile industry in Pakistan. At the initial stages of the renewable energy integration, the textile industry may not accept the initial cost of the implementation. Government of Pakistan and business owners should support the utilization of the renewable energy based technologies.

Plantation Drive & Competition



Plantation Drive

Plantation drive was conducted by students and faculty of Department of Textile Engineering, UET Lahore (Faisalabad Campus). The department's faculty, staff and students contributed for this noble cause of plantation to keep the nature clean and green. It is part of the twice a semester activity carried out by the Department voluntarily.

Inter session Plantation Competition

A glance at the event (Plantation Drive competition) arranged by Department of Textile Engineering. Every year plantation drives have been conducted by textile department. In addition, certain side of the lawn and many other plants are assigned to each present session at the department and students need to take care of their respective assigned plants' area.





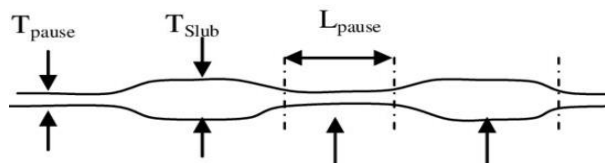
Dr. Aamer Abbas Khan

Assistant Professor, Textile engineering department, ,
UET Lahore, Faisalabad Campus

Recent Trends in Spinning of Slub yarn

Slub yarn

A slub yarn is one in which slubs have been deliberately created to produce the desired discontinuity of effect. Slubs are thick places in the yarn. They can take the form of a very gradual change, with only a slight thickening of the yarn at its thickest point. Alternatively, the slub may be three or four times the thickness of the base yarn, and that thickness may be achieved within a very short length of yarn.



Manufacturing techniques

The slub effect can be produced by a variety of means, each offering its own benefits and challenges. The finer slubs can be used simply to introduce a subtle but pleasing variation in the surface appearance of a plain fabric and are used often for this purpose in both upholstery and apparel fabrics. On the other hand, the heavier slub effects produce stronger variations in the fabric surface and can become a design element in their own right. The yarns are used both in knitted and woven fabrics, although it is worth recalling that, until very recently, most of the methods for producing slub yarns carried the penalty that the thick place in the yarn was followed immediately by a thin place, rather than by a simple return to the basic yarn count being spun. This, in turn, creates a weak place in the yarn, and slub yarns have needed very careful balancing of feed and delivery speeds in order to avoid the production of yarns too weak for processing. A variety of methods are available for producing slub yarns, and the resulting yarns may be divided into the following classes:

1. Slub yarns produced at the spinning frame are known as spun slubs. They can be produced by blending fibres of different dimensions, as for example woolen slubbing with worsted top sliver the imperfect fibre control during drafting produces randomly distributed slubs of varying size. 'Spun slubs', as described above, can be created by mixing fibres of different properties, in particular fibres having different staple lengths. The differing behaviour of these fibres during drafting then produces the irregular slub effects. The final spinning process is simple and easy to set up, but in this case, it is at the expense of being required to produce a sliver or roving that blends these differing yarns.
2. Plucked or inserted slub yarns are composed of two foundation threads and periodic short lengths of straight-fibred materials that have been plucked from a twist less roving by roller action. This method tends to give a neater,

cleaner appearance than is achieved in producing spun slubs. It is possible to create an effect similar to the spun slub, but far more exaggerated, by the injection method, which is described above for the production of 'flake' or 'flammé' yarns. These are particularly long, heavy slubs.

3. An alternative method is to modify the spinning frame such that the intermittent acceleration of the rollers causes varying degrees of draft to be applied. Such a slub in relatively fine yarn will be a fine and fairly long slub. This method might also be used to produce a slubbed roving from which a yarn could be spun using constant draft; of course the yarn created in this way would have very long slubs that become apparent only gradually. As the method suggests, the way of achieving this is to vary the speeds of the rollers to cause irregular fibre flow and thus an irregular yarn. This produces 'ground slubs', which are slubs that have the same fibre composition as the yarn. This type of slub is formed of a single structure; no additional yarn or process has been involved in creating this yarn. Such a yarn, while having the distinct merit of simplicity, being easy to understand and straightforward to set up, can prove to be problematic in use, since the slubs take up very little twist and become weak spots in the yarn.
4. A further method would lie in the injection of additional material into the drafting zone. The setting must be varied over a very long repeat to avoid patterning the material. This method allows the production of 'flake' (very long slub) yarns.
5. Slubs can also be produced by adjusting the card settings so that the fibre stock is 'rolled' to form nepps or slubs. This is simply the opposite of the normal carding action. It is possible to produce slubs by varying either the cylinder-doffer setting or the doffer speed. However, this technique is rarely employed because it is very

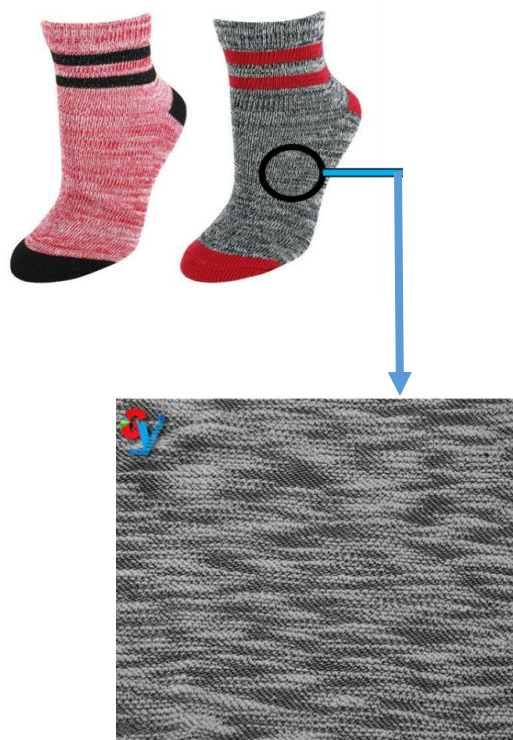
difficult, and therefore time consuming, to alter the speed of these large cylinders. A better yarn can be produced by using fibres that have good cohesion between them.

6. Finally, recent developments in open end spinning have made it possible to create rotor spun slub yarns.

Applications

Slub yarns have been used in a variety of knitted and woven fabrics suitable for both winter and summer wear. A generic list of such apparel for both menswear and women wear are as follows

1. Socks
2. Pullovers
3. T shirts
4. Jeans
5. Shirting
6. Handicrafts
7. Home textile products
8. Furnishing fabrics



Textile Sustainability Working Group



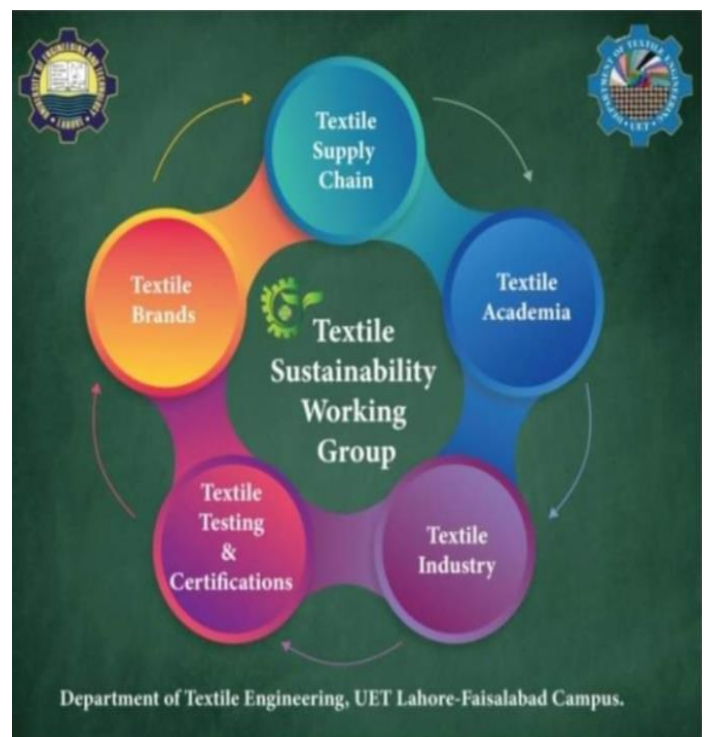
International
Labour
Organization



“Textile Sustainability Research Group” is formed by Department of Textile Engineering (UET Lahore, Faisalabad Campus) and supported by other key stakeholders as “Founding Members” including TTI, BCI, CERAD, Interloop, KICS, WWF and Archroma Pakistan. The group was announced during the 4th International Conference on Sustainable Textile 2021. This Working Group will conduct training and seminars, regular sharing of knowledge and best practices, mill assessment related to energy conservation and textile sustainability and joint R&D projects.

Textile sustainability is a global challenge, and it needs coherent efforts from various stakeholders like universities, mills, textile chemical companies, testing companies, brands, associations and NGOs to collaborate in order to achieve the target of textile sustainability in textile supply chain. These efforts are needed not only to attract more international brands, more textile orders, more jobs but for the less usage of resources like good quality water, less wastewater discharge, less air emissions and environment protection of the country. Textile is the backbone of Pakistan economy but situation of textile sustainability in Pakistan needs more coherent efforts. Therefore, “Textile sustainability working group” at Department of Textile Engineering, UET Lahore, Faisalabad Campus is established to take more practical and coherent steps

towards textile sustainability with the support of the collaborators and relevant stakeholders.



The website of Textile sustainability working group is officially launched and details can be found at <https://conferences.uet.edu.pk/textile/icst/2021/textile-sustainability-working-group/>

Textile Sustainability Working Group

Founding Members

Founding members of textile sustainability working group are:

- Department of Textile Engineering UET Lahore
- BCI (Better cotton initiative)
- TTI testing laboratories
- WWF
- CERAD
- Interloop
- KICS
- Archroma Pakistan

General Members

More than 220 members since 19th May 2021 have already registered for textile sustainability working group. More and more textile industry and other stake holders are joining this group.

Projects

There are more than 30 Key projects in the textile sustainability research group related to textile sustainability. You can find the projects in given link.

<https://conferences.uet.edu.pk/textile/icst/2021/projects/>

Textile Sustainability Research Group

Active research is being carried out in the textile sustainability research group on various areas of sustainable textile which include new fiber development, new fabric development, new garment development, new textile specialty chemical development, new machine development, new process development, value addition, IT based textile solutions, energy conservations, recycling of textile, indigenous bio based

carbon development, sustainability training and support in certifications like ZDHC, STeP, Higg Index etc.

Trainings

Textile sustainability working group regularly organizes various trainings on textile supply chain, ZDHC, textile sustainability and textile industry. You can find the list of trainings under given link.

<https://conferences.uet.edu.pk/textile/icst/2021/trainings/>

Equipment

Department of textile engineering have state of the art 12 labs related to textile and over 120 equipment are installed in it.

Scientist/resource persons

Textile sustainability working group have active research group in which more than 40 scientist/resource persons are working on textile sustainability.

Developed Technologies

There are various developed technologies available for pilot trials and commercialization to the textile industry related to textile supply chain, Energy and IT.

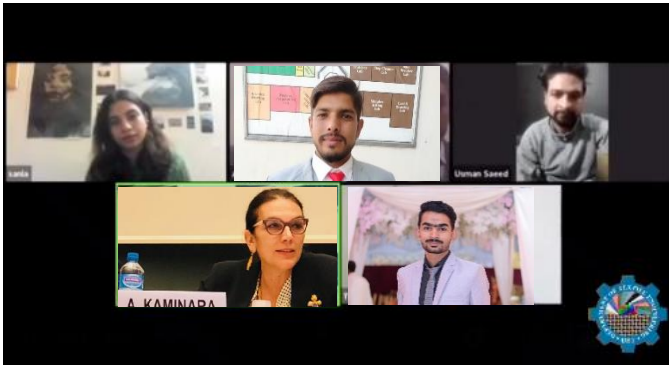
<https://conferences.uet.edu.pk/textile/icst/2021/developed-technologies/>

For free membership, register here

If you are not already the member of this group then type this link on google and get registered yourself <https://bit.ly/3vHBZkD>

Competitions Won by Students of Textile Engineering Department

Face mask design competition by European Union



"European Union Face Mask Competition" was arranged by EU in Pakistan. Students from 27 universities from all over Pakistan participated in this competition. Mr. Ali Asadullah and Mr. Umar Farooq from department of textile engineering participated in this competition and secured 2nd position. EU Ambassador H.E. Androulla Kaminara appreciated UET textile students for their novel and technical idea

Innovation Event was held by University of Punjab

Innovation Event was held by Punjab University. More than 250 students from 20 universities of Pakistan participated in it. UET Textile Department participated at invention to innovation event 2017, 2018 at Punjab University. In these events the students of Textile Engineering Department got the textile innovation award and cash prize.



SDC-UK international design competition



UET Textile Engineering Department student has won the third prize at the SDC-UK international design competition 2018. Her idea was related to natural coloration of textile without using toxic mordant and its impact on color. In this competition, more than 250 students from 20 Universities of Pakistan presented their projects and more than 500 visitors from textile industry & academia attended the event.



Dr. Usama Bin Humyaon

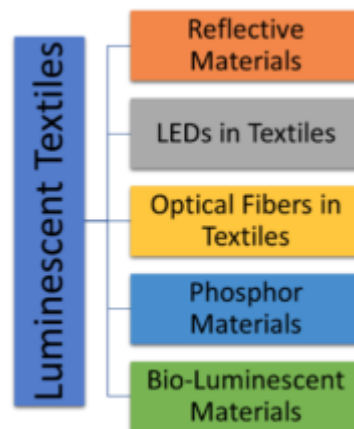
Assistant Professor, Textile engineering department,
UET Lahore Faisalabad Campus

Engineering Luminous Textiles

Engineering Luminous Textiles The remarkable technological advancements, particularly the desire of wearability have changed our lives in many ways. Smart products with multifunctional characteristics have taken over the conventional devices. The textiles once considered the symbols of civilization and industrialization have also seen paradigm changes in the recent years. In addition to the conventional basic requirements of aesthetics, comfort and warmth, additional functionalities are increasingly imparted in the textiles and are termed as smart textiles. Smart textiles have the characteristics of sense the external stimuli react or maybe adapt to it through various functionalities added in the textile structures. The stimulus or response may be of clinical, mechanical, electrical, thermal, chemical, etc. origin. Owing to the additional functionalities these textiles are finding indispensable applications in medical, industrial, technical, and household areas.

The recent pandemic of COVID-19 has further highlighted their applications especially in hygiene, protection, and health monitoring avenues. Amid the COVID-19 crisis, the contemporary global market for Smart Fabrics is projected to reach a revised size of

US\$11.4 Billion by 2027, progressing at a CAGR of 18% over the analysis period 2020- 2027. Among the various smart textile's, luminescent textiles (textiles that emit photons/luminescence/light) are gaining importance particularly for the healthcare, personal safety, military, fashion, and wearable electronic devices.



Luminescence in textiles was originally demonstrated decades ago. Over the period, different techniques, primarily based on applications and research have been developed. The figure sums up various methods employed for the development.

Reflective Pigments

The common practice of achieving a glowing effect in textiles is the use of reflective pigments or tapes on the textiles. Such textiles find widespread applications in the safety garments, used by the traffic police, workers etc. The process is comparatively facile and low cost; however, it has many associated limitations. The drawbacks include compromise of basic textile characteristics of comfort and washability. The requirement of the incident light for the exhibition of luminous characteristics limits the application in the dark areas.

LEDs in Textiles

The invention of light emitting diodes (LED) based lighting devices not only found widespread applications in the field of lighting but also in several field of electronics. As compared to the conventional lightings these devices are very compact, consume less power, environmentally friendly and have longer lifetimes.

Benefiting from these properties LEDs are applied in the textiles. The advantages of such luminescent textiles include multicolored luminescence, facile fabrication, displays for various sensors and modern electronics. On the other hand, the disadvantages include the building up of circuit through the textiles, requirement of a power source and affected comfort characteristics.

Optical Fibers in Textiles

An optical fiber is a thin, flexible, and transparent fiber made by drawing silica (glass) or plastic in a structure having a core surrounded by a transparent cladding. These fibers transmit light between the two ends by the phenomenon of total internal reflection. These fibers are commercially available in bundles called multi strand glow cables. Originally these cables are used to transmit communication signals. These fibers found applications in textiles mainly for fashion in the last decades of the pervious century, however recently textile based optical sensors for medical and geotextiles have been demonstrated. For the wearable sensors, optical fibers have potential advantage over other materials due to their fibrous nature. The optical fiber exhibits similar characteristics to textile fibers and can be ideally processed like standard textile yarns. The development of polymer optical fibers, with their outstanding material properties, offer additional benefits to users. The

integration of optical fibers in textiles is robust and cost effective, but the constraints of requirement disruption of sharp bends and the requirement of powered source have barred them from proliferation.



light

Phosphor Materials for Luminescent Textiles

Among various techniques employed for the development of luminescent textiles, the use of phosphorescent materials is found to be the most effective. Phosphorescent materials absorb energy from

the environment and release it slowly in the form of luminescence. Depending upon the materials the input energy varies from daylight (photons) to mechanical or electrical. The luminescence can last up to several hours hence making them potential candidates with the ability of glow in dark. Phosphorescent materials are inorganic materials, conventionally applied through screen printing on textiles. A combination of different phosphorescent materials is used to achieve luminescence of the desired color. In recent years these materials are incorporated in the yarns, which further eases their integration in the textiles. The integration of these materials is also paving a way for the wearable displays. Phosphorescent materials majorly comprise of rare earth elements as activators; hence the cost of materials is still a challenge. Additionally, these materials are moisture sensitive, losing the glow on exposure to water therefore limit the washability of the garment. The techniques of encapsulation and incorporation into yarn have addressed the challenge and hence such materials are intensively investigated for multifaceted applications in textiles.

Bio-luminescent Materials

Luminescence in textiles can be achieved by using a bioluminescent reaction system. Bioluminescence is the emission of light by living organisms and occurs widely in marine organisms. It is a form of chemiluminescence; emission of luminescence by the reaction of a light emitting molecule and enzyme. Nature has equipped a variety of organisms with the ability to produce and emit light, for example, fungi, bacteria, ctenophores, molluscs, and fish. These organisms use bioluminescence for camouflage, defense, attracting partners, or attracting prey. Recently the integration of bioluminescent materials in textiles is successfully demonstrated. Amid the uproar of sustainability, natural or bio-origin materials are extensively investigated for almost every application. The successful integration of such phenomenon in the textiles have paved a sustainable way forward. The process of integration into textiles still requires sensitive treatments and processes and is open for research and development.



Research work Carried out by **TEXTILE ENGINEERING** Department

Department of Textile Engineering is actively involved in research related to textile sustainability in collaboration with top textile industry of the country. Faculty of Textile Engineering Department has published over 150 research papers, six books/book chapters, four patents in last five years. Department faculty have also won number of research projects from various funding agencies including HEC, PSF, PHEC, and textile industry. Certain key research projects carried out by the department include;

1. Development of energy and water efficient textile bleach recycling system
2. Development of sustainable fiber, fabric and their coloration from agro waste (Banan, okra etc)
3. Development of digital printing inks and optimization of digital printing process.
4. Recycling of textile and tyre industrial wastes for the development of indigenous carbon black
5. Water and energy efficient foam processing Dyeing & Finishing
6. Productivity improvement of the textile industry
7. Garment industry machine line efficiency
8. Recycling of textile into value added digital printing inks
9. Sustainable process (water, energy & chemical efficient) development
10. Recycling of textile wastes into value added product
11. Sustainable natural dyeing without toxic mordant
12. Textile process optimization for organic cotton and better cotton
13. Development of water less dyeing and finishing process
14. Eco friendly, sustainable & halogen free fire retardants for textile
15. Sustainable and durable oil & water repellent for textile
16. 100% bio based anti-viral and anti-microbial textile
17. Eco friendly bio Mosquito repellent finishing for textile
18. Development of novel dyeing process
19. Efficient synthesis of fluorescent materials
20. Nano bubble dyeing and finishing machine and process development.



Key Focus of the Research at the Department

- Innovative & sustainable yarn development
- Innovative & sustainable fabric development
- Sustainable textile chemical development
- Sustainable garment manufacturing
- Sustainable textile machine development
- Medical Textile
- Textile mill productivity improvement
- Recycling of textile
- Water and chemical efficient textile process development
- Sustainability certifications
- Sustainable functional materials

DEPARTMENT OF TEXTILE ENGINEERING



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