

**March 2<sup>nd</sup> – 3<sup>rd</sup>, 2020 • Karachi, Pakistan**

# **NEDITC 2020**

**4<sup>th</sup> International Textile Conference**

## **Book of Abstract**

The abstracts in this book represent the program of 4<sup>th</sup> International Textile Conference held on 2<sup>nd</sup> – 3<sup>rd</sup> March, 2020, in Karachi, Pakistan.

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Textile Engineering Department, NED UET

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# 4<sup>th</sup> NED International Textile Conference (NEDITC 2020)

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## 5<sup>th</sup> All Pakistan DICE Textile Innovation Event

### Technical Programme

Day 1: Monday, March 2 <sup>nd</sup> 2020			
09:00 – 11:00	Inaugural Session Venue: Main Auditorium	09:00 – 09:10	Opening & Recitation
		09:10 – 09:15	National Anthem
		09:15 – 09:30	VC NEDUET/ DICE Patron Address
		09:30 – 09:45	DICE Chairman Address
		09:45 – 09:55	Opening Remarks by Conference Chair
		09:55 – 10:10	Chief Guest Speech
		10:10 – 10:40	Address by Guests of Honor
		10:40 – 10:50	Vote of Thanks by Conference Secretary
11:00 – 11:30	Exhibition Booth Visit & Ribbon Cutting Ceremony		
11:30 – 11:50	Tea Break ( <i>Urban Department Garden</i> )		
12:00 – 01:15	Panel Discussion-I ( <b>Sustainable Textile Value Chain: Reality and Challenges</b> )		
01:15 – 02:30	Prayer/Lunch Break ( <i>Urban Department Garden</i> )		
02:30 – 02:45	<b>Mr. Arif Ahmed Khan, Chief Executive, Trade Development Authority of Pakistan</b> Conference Keynote		
02:50 – 04:10	Conference Technical Session-I Venue: Main Auditorium	<b>Session-I</b>	
		<b>Session Chair: Dr. Abdul Jabbar ; Session Co-Chair: Dr. Fareha Asim</b>	
		02:50 – 03:10	<b>Mr. Mujtaba Rahim, President &amp; CEO, Archroma Pakistan</b> Plenary Speaker
		03:10 – 03:30	<b>Mr. Karl Borgschulze, MD, Consulting Service International</b> Plenary Speaker
		03:30 – 03:50	<b>Mr. Mahesh Nabadawewa, Global Technical Manager, USB Certification</b> Plenary Speaker
03:50 – 04:10	<b>Microwave-Assisted Green Synthesis of Reactive Dyes for Digital Printing</b> Dr. Saira Faisal, NED University, Karachi		
04:10 – 04:30	Presentation of Souvenirs to Sponsors		
8:00 pm	Gala Dinner ( <i>Urban Department Garden</i> )		

# 4<sup>th</sup> NED International Textile Conference (NEDITC 2020)

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## 5<sup>th</sup> All Pakistan DICE Textile Innovation Event

### Technical Programme

**Day 2: Tuesday, March 3<sup>rd</sup> 2020**

09:00 - 09:15	Opening And Recitation	
09:15–10:45 <b>DICE SHARK (Parallel Session)</b> Venue: <b>NIC Auditorium</b>	Conference Technical Session-II Venue: Main Auditorium	<b>Session-II</b> Session Chair: Prof. Dr. Muzzaffar Mahmood; Co-Chair: Dr. Agha Deedar Hussain
		09:15 – 09:30   <b>Mr. Mujeeb Ullah Khan, CEO, iTextiles</b> Plenary Speaker
		09:30 – 09:50   <b>Investigation to Improve the Pilling &amp; Wrinkle Resistance Properties of Bamboo and Bamboo/Cotton Fabrics</b> Dr. Farhana Naeem, NED University, Karachi
		09:50 – 10:10   <b>Endless Re-engineering</b> Mr. Laszlo Szabo, TimeSSD
		10:10 – 10:30   <b>Mineral Fiber: Basalt. Future of Composites</b> Dr. Hafsa Jamshaid, NTU, Faisalabad
		10:30 – 10:45   <b>Think Big with Nano: Commercialization of Nanofibers Innovation</b> Dr. Zeeshan Khatri, MUET, Jamshoro
10:45 -11:15	Tea Break ( <i>Senate Hall</i> )	
11:20–01:00 <b>National Innovation Basket (Parallel Session)</b> Venue: <b>NIC Building</b>	Conference Technical Session-III Venue: Main Auditorium	<b>Session-III</b> Session Chair: Dr. Awais Khatri; Co-Chair: Dr Saira Faisal
		11:20 -11:40   <b>Plasma-Assisted Functional Finishing of Wool and Cotton Fabrics for Improved Dyeability with Natural and Synthetic Dyes</b> Aminoddin Haji, Yazd University, Iran
		11:40 -12:00   <b>Evaluation of Flame Retardancy Characteristics of Ammonium Polyphosphate Modified High Performance Epoxy Composites</b> Dr. Laraib Alam, NESCOM, Islamabad
		12:00 -12:20   <b>Ecofriendly Dyeing Of Cotton Fabric via Covalent Crosslinking with Reverse Micelle System</b> Dr. Aiqin Hou, Donghua University, China
		12:20 -12:40   <b>Development and Testing of Compression Medical Stockings</b> Mr. Zeeshan Azam, NTU, Faisalabad
		12:45 - 01:00   <b>Continuous Dyeing of Cellulose Electrospun Nanofibrous Mats with Synthetic Indigo Dyes</b> Dr. Shamshad Ali, MUET, Jamshoro
01:05 - 02:15	Prayer/Lunch Break ( <i>Senate Hall</i> )	
02:30 - 03:30	Panel Discussion-II ( <b>4<sup>th</sup> Industrial Revolution, Digital Transformation and Smart Manufacturing</b> )	

		<b>Session-IV</b>	
		<b>Session Chair: Dr. Hafsa Jamshaid; Co-Chair: Dr Muhammad Ali</b>	
03:35 – 05:40	Conference Technical Session-IV Venue: Main Auditorium	03:35 - 03:55	<b>Mr. Muhammad Tayyab Hafiz, Society of Dyers and Colourists</b> Plenary Speaker
		04:00 - 04:20	<b>Establishment of Sustainable Marketing Hierarchy Based On D2C Platform of Taobao Mall</b> Ms. Wenjie Yan, Minjiang University, China
		04:20 - 04:40	<b>Development of Light Weight and Flexible Neck Guard Fabric for Ice Hockey Players</b> Mr. Usman Ahmed, NTU, Faisalabad
		04:40 - 05:00	<b>Factors Affecting Export Performance of Raw Woven Fabric Manufacturing Sector of Pakistan</b> Dr. Allahdad, PIFD, Lahore
		05:00 - 05:20	<b>Cellulose Acetate/ Silver Sulfadiazine Nanofibers for Antibacterial Applications</b> Dr. Muhammad Qamar Khan, NTU, Karachi
		05:20 - 05:40	<b>Graphene Oxide (GO) Deying Of Cotton Fabric Using Pad-Dry Cure Method; a Binder Free Approach for Wearable E-Textiles</b> Dr. Nazakat Ali Khoso, BUITEMS, Quetta
05:45 - 06:00	Closing Remarks		
06:00 - 06:15	DICE Shark & NIB Announcements		
06:15 - 06:30	Presentation of Awards to DICE Projects		

# Sustainability @ Textiles

**Mujtaba Rahim**<sup>1</sup>

<sup>1</sup> Archroma Pakistan Limited

## ABSTRACT

Sustainability @ Textiles is a process of bringing continued improvement to our purpose; what we do, gives us the inspiration; how we do it and most importantly our belief; why we do it; and this is embodied in the following statement which summarizes our “why”:

“We continuously challenge the status quo in the deep belief that we can make our industry sustainable.”

Sustainability @ Textiles essentially means being a responsible stakeholder within the value chains in which we operate:

- To ensure that our products and services do not impose any detrimental risk towards health or to the environment;
- To develop technologies that enable reductions in resources required for production, not only in our own manufacturing but in also more importantly in downstream production of the value chain, where we can lever significant sustainability impacts of our customers;
- To ensure a long-term business platform to enable a continued return on investment for our investors and thus sustain our ability to make positive impact.

Consumers aspire to goods that bring them function, beauty and meaning – goods that are made in a more sustainable and responsible way. Textile industry can aim to makes a positive contribution to this aspiration across all its core areas. Textile businesses can create powerful new processes that:

- enable us to get more from less;
- support the partners’ sustainability ambitions;
- that help contribute to a bright and beautiful world.

# From Technical Textiles to Performance Textiles

**Mujeeb ullah Khan<sup>1</sup>**

<sup>1</sup> iTextiles® (Pvt.) Ltd.

- Introduction to iTextiles
- What are Technical Performance Textiles (Conventional v/s Technical)
- Categories of Technical Performance Textiles
- Attributes and end users of Performance Textile
- Growth Drivers
- Product Design V/s Performance Strategic Fit
- Industry Forward and Customer Driven Model
- Global Customer Insights and trends
- Fashion and Casual Apparel
- Merger of Fashion and Workwear

# Endless Re-Engineering

**Laszlo Szabo<sup>1</sup>**

<sup>1</sup> *TimeSSD*®

## ABSTRACT

Brands and buyers are placing orders in our countries (Pakistan and Romania) because their total costs with labor, logistics and stress is less than to investing and using the latest automation technology in their places. The customer's demands, for sustainability and customized products, compressing the manufacturers time faster than the speed of increasing the prices. In parallel, Africa strengthens and becomes a huge source of competitors. With the price-based costing the pressure is on the back of the IEs to create and re-create the productivity. The companies must change their behaviour, must focus on their main assets – the human resources – and should introduce customized incentive systems. The IEs must acknowledge that the engineering job is an endless re-engineering. New approaches, new tools, real transparency and higher attention to the details are required. The things happen on the shop floor, the ready product is a result of a series of blinks and the right KPIs starts the alarm in the right time. The IE should put its stopwatch on the wall as historical piece. Instead of it should have a camera, a notebook and an internet connection. The camera could capture the copy of any number of certificates, but the paper's effect is zero on the sales. Same null effect has the infinite development of colored, multicolumn and multiline Excel tables. The internet is the fastest and cheapest sourcing place of the novelty solutions. There are available ideas, best practices and investment free predetermined motion time software for methods development and benchmark times.

**Keywords:** Accuracy, Concern, Detail, Employee, Industrial Engineer, Method study, Productivity, SAM, Time study, Work measurement.



# **Fashion towards Sustainability**

**Mahesh Nabadawewa<sup>1</sup>**

<sup>1</sup> USB Certification

## **ABSTRACT**

Clothing has been evolved to "fashion" and it is one of the biggest industries in the world today. It has been creating gigantic impact on the people, environment and the economies which are known as triple bottom line of "sustainability". This presentation will be an eye-opener for those who enter the industry with vast academic knowledge, professionals who wish to learn sustainability aspects beyond known technical aspects of textile and apparel production.

When the fashion enhances with its aesthetic value, cost of resources simultaneously arises. The optimum level of production capacity of natural raw materials, limitation of other resources such as water and energy, exploitation of labour and make profits are under enormous challenges today. 'Global Standard' with 'GOTS' and 'Textile Exchange' (TE) with number of standards introduced to address raw materials to production processes in a sustainable manner minimizing the impact.

Over a decade of implementation of those standards operating companies have been able to reach above-average environmental and social practices in their facilities keeping peaceful working environment for their employees and surrounding communities also it became another business segment.

I wish this presentation would enhance the curiosity of audience to research and study further developments of the "sustainability" concept in the fashion industry.

# Plasma-Assisted Functional Finishing of Wool and Cotton Fabrics for Improved Dyeability with Natural and Synthetic Dyes

**Aminoddin Haji<sup>\*1</sup>, Mohammad Khajeh Mehrizi<sup>1</sup>, Majid Nasiriboroumand<sup>2</sup>, Mahdi Hasanzadeh<sup>1</sup>**

<sup>1</sup> *Department of Textile Engineering, Yazd University, Yazd, Iran*

<sup>2</sup> *Department of Carpet, Shahid Bahonar University of Kerman, Kerman, Iran*

*\*Corresponding Author: [ahaji@yazd.ac.ir](mailto:ahaji@yazd.ac.ir)*

## ABSTRACT

Surface functionalization can influence different properties of textiles like wettability, dyeability, adhesion, and bio-compatibility. In this study, low-pressure O<sub>2</sub> plasma was used for surface activation and attachment of chitosan on cotton and wool fabrics. Each chitosan-treated sample was dyed with model natural and synthetic dyes. The effect of chitosan treatment on the color strength and fastness properties of the samples dyed with different dyes was investigated. The results showed that plasma-assisted chitosan attachment enhanced the color strength of the dyed cotton and wool fabrics. Wash and light fastness properties were also improved.

**Keywords:** Cotton, Plasma, Chitosan, Natural Dye, Fastness, Direct Dye, Wool.

# Ecofriendly Dyeing Of Cotton Fabric via Covalent Crosslinking with Reverse Micelle System

Aiqin Gao<sup>1</sup>, Mohammad Irfan<sup>1</sup>, Aiqin Hou<sup>2</sup>, Kongliang Xie<sup>1\*</sup>

<sup>1</sup> *Key Lab of Science & Technology of Eco-textile, Ministry of Education, College of Chemistry, Chemical Engineering and Biotechnology, Donghua University, Shanghai 201620, P R China*

<sup>2</sup> *National Engineering Research Center for Dyeing and Finishing of Textiles, Donghua University, Shanghai, 201620, P R China*

\*Corresponding Author: [klxie@dhu.edu.cn](mailto:klxie@dhu.edu.cn)

## ABSTRACT

A new ecofriendly cotton fabric dyeing technique, reverse micelle dyeing with little water via covalent crosslinking, was designed. Octamethyl cyclotetrasiloxane (OMCTS) was used as the carrier of mass and heat transfer, and the reverse micelle was as covalent crosslinking reactor, which could be absorbed on cotton fabric. Three reactive dyes with two vinyl sulfone sulfate groups, R1, R2 and R3, which could form covalent crosslinking with cellulose fiber, were used for the reverse micelle dyeing. The reverse micelle dyeing could obtain a high exhaustion of 97.35%, 92.10% and 93.80% for R1, R2 and R3, respectively. The cotton fabric was like an oil-water separator in the dyeing process, where the dye micelles permeated into the cotton fabric and OMCTS circulated around the fiber to transfer mass and energy. The dyes had good building up property, excellent fastness and levelling properties with the reverse micelle dyeing.

**Keywords:** Cellulose fiber; Reverse micelle; Cotton dyeing; Covalent crosslinking; Small bath ratio

# Design and Research of Aramid Stainless Steel Composite Yarn

## Multifunctional Knitted Fabric

NI Haiyan<sup>1,2</sup>, LI Yonggui<sup>1,2</sup>, BAO Zongyao<sup>1</sup>

<sup>1</sup> *Clothing and Design Faculty, Minjiang University, Fuzhou 350108, China;*

<sup>2</sup> *Fujian Province Key Laboratory of New Novel Functional Fibers and Materials, Fuzhou 350108, China*

### ABSTRACT

The traditional electromagnetic shielding fabric is usually realized by the weaving method, and the wearing performance is poor and the function is single. Therefore, to development the electromagnetic shielding fabrics with good comfort and flame retardant properties has great practical value. Adopt the aramid and stainless steel composite yarn to design the knitted fabric, by changing the fabric structure and the level of compatibility, using computerized flat knitting machine to woven different knitting tissues. Teste and analyze the electromagnetic shielding effect and influencing factors and the flame retardant and washable of this fabric. The experimental results show that the aramid and stainless steel composite yarn knitted fabric has excellent flame retardancy and water wash resistance. The structure of the fabric is the main factor affecting the electromagnetic shielding effect.

**Keywords:** stainless steel fiber; aramid fiber; electromagnetic shielding; flame retardant; washable

# **Establishment of Sustainable Marketing Hierarchy Based On D2C**

## **Platform of Taobao Mall**

**WenJie Yan**<sup>1,2</sup>

<sup>1</sup> *Fujian Key Laboratory of Novel Functional Textile Fibers and Materials, Minjiang University, Fuzhou, China*

<sup>2</sup> *Graduate School of Design, National Yunlin University of Science and Technology,*

*Douliu, Yunlin, Taiwan*

### **ABSTRACT**

Based on the circuit of culture proposed by Paul du Gay, combined with the expectation confirmation theory, this paper aims to establish a sustainable marketing hierarchy for the D2C marketing model in China Taobao Mall. The study used informal interviews to collect data and combined with Grounded theory for dimension extraction. The statistical analysis of data was conducted by questionnaire survey method, and the development model combining e-commerce marketing model and designer brand culture was explored. Through the research, the following conclusions are obtained: the user's recognition of the product is positively related to the user experience; the emphasis on the communication of the design elements has a significant impact on the user experience.

# Liquid mobility on superwetable surfaces for applications in energy and the environment

**Songnan Zhang**<sup>1</sup>

<sup>1</sup> *Tiangong University*

\*Corresponding Author: [zhangsongnan@tiangong.edu.cn](mailto:zhangsongnan@tiangong.edu.cn)

## ABSTRACT

Liquid mobility on super-wetable materials is of interest for enhanced heat transfer, self-cleaning, antifouling, anti-icing, water-harvesting, and oil–water separation. Liquid behaviors on super-wettable materials involve vertical motion (droplet self-propelling and bouncing), horizontal transportation (transportation on one-dimensional (1D) and two-dimensional (2D) materials), and interfacial penetration (oil–water penetration and water penetration). As for the vertical motion, bioinspired from the lotus, the ability to release the adhered drops on superhydrophobic surfaces is very important. In this paper, three types of in situ electrochemical anodizing TiO<sub>2</sub> nanostructure films are rationally designed and fabricated on titanium substrates with special superwettability, viz., TiO<sub>2</sub> nanotube arrays, irregular TiO<sub>2</sub> nanotube arrays, and hierarchical TiO<sub>2</sub> particle arrays (HTPA), and their corresponding behavior in condensate microdrop self-propelling (CMDSP) is investigated. Compared to the flat titanium counterpart, all three types of rough TiO<sub>2</sub> samples demonstrate a uniform distribution of smaller microscale droplets. Among the treated surfaces, the HTPA possesses the highest condensate density, and more than 80% of the droplets possess a diameter below 10 μm. Theoretical analysis indicates that the feature is mainly due to the morphology and structure induced extremely low droplet adhesion on superantiwetting TiO<sub>2</sub> hierarchical surfaces, where the excess surface energy released from the migration leads to the self-propelling of merged microdrop. This work offers a way to rationally construct CMDSP surfaces with excellent self-cleaning, anti-frosting/ icing ability, and enhanced condensation heat transfer efficiency.

# Cellulose Acetate/ Silver Sulfadiazine Nanofibers for Antibacterial Applications

**Muhammad Qamar Khan<sup>1\*</sup>**

<sup>1</sup> *Department of textile and clothing, faculty of engineering and technology, National Textile University, Karachi*

\*Corresponding Author: [drqamar@ntu.edu.pk](mailto:drqamar@ntu.edu.pk)

## ABSTRACT

The antibacterial activity of metallic (silver, gold, copper, platinum) nanoparticles and metallic oxide (ZnO, TiO<sub>2</sub>, Ag<sub>2</sub>O, Fe<sub>2</sub>O<sub>3</sub>, CuO, CaO, MgO and SiO<sub>2</sub>) nanoparticles have been investigated for the in-vitro and in-vivo but Ag nanoparticles showed the appreciable results for antibacterial activity and also biocompatibility, therefore it could use preferably in various medical applications such as antibacterial, antiviral, antifungal and also inflammatory agents but silver sulfadiazine (SSD) is the more attractive agent for diverse biomedical applications. More specially, SSD has been demonstrated to act as strong adsorbents to disturb the biochemical route of microbial by formation of reactive oxygen and electron transfer reactions. The surface modification of nanofibers web enables the invention of bioactive scaffolds or wound dressings by using the simple materials substrate without altering the mechanical properties of foundation materials or nanofibers web. Herein, we tried to fabricate the novel antibacterial wound dressings by functionalizing the surface of Cellulose acetate (CA) nanofibers through facile method. The silver sulfadiazine (SSD) nanoparticles were successfully synthesized on the surface of cellulose acetate nanofibers web by in-situ facile method in which nanofibers webs were immersed in the solution of sodium sulfadiazine salt and silver nitrate (AgNO<sub>3</sub>) for three different interval of times (hrs). The resultant CA/SSD nanofibers were characterized by scan electron microscope, transmission electron microscope, FT-IR, XPS, XRD, water contact angle, tensile strength test, and antibacterial agar disc diffusion test. All characterization results supported that this composite can be used for antibacterial wound dressings, especially for gram negative E. Coli bacteria because SSD has great potential against E. Coli bacteria.

# Investigation to Improve the Pilling & Wrinkle Resistance Properties of Bamboo and Bamboo/Cotton Fabrics

**Farhana Naeem<sup>1\*</sup>, Fareha Asim<sup>1</sup> and Muhammad Tufail<sup>2</sup>**

<sup>1</sup> *Department of Textile Engineering, NED University of Engineering & Technology,  
Karachi, Pakistan*

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## ABSTRACT

In this research pilling and wrinkle resistance properties of 100% bamboo and 50:50 bamboo:cotton fabrics were investigated by using anti-pilling and resin finishing. The plain woven unsinged fabrics were finished using Appretan N9211 as anti-pilling agent and Arkofix NF (DMDHEU) as crosslinking agent. The investigation was done using three different concentrations 40,100 and 150g/l of both the chemicals. Both the finishes were applied in one bath but fixation of the finish was done at normal and shock cure. The improvement in pilling resistance of grade 4.5 and dimensional stability within +/- 3% were achieved at all concentrations of the chemicals and fixation methods. However, for wrinkle resistance, improved results were obtained at higher concentration (100g/l) of Arkofix NF using normal cure. Furthermore, tear strength of 100% bamboo increased but for 50:50 Bamboo:cotton there was a slight loss of strength observed after finishing.

**Keywords:** Bamboo, Bamboo:cotton , Pilling, Wrinkle resistance, Anti-pilling, Crosslinking agent



# Development of Light Weight and Flexible Neck Guard Fabric for Ice Hockey Players

**Usman Ahmed<sup>1\*</sup>, Yasir Nawab<sup>1</sup>, Muhammad Umair<sup>1</sup> and Ali Raza<sup>1</sup>**

<sup>1</sup> *Faculty of Engineering, National Textile University, Pakistan*

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## ABSTRACT

Wound usually observed on ice hockey player neck. These wounds may be considered as life threatening due to presence of small blade on lower side of skate shoes. So, neck guards are important tool for protection and care of neck. The neck guards must be lighter in weight, flexible, fit on all body sizes and having high abrasion and cut resistance. But currently available neck guards are stiffer and lack of size adaptability. One of the solutions is to develop knitted fabric with high performance yarns to get better abrasion and cut protection. In this work, we used high performance fibers (Kevlar and Polyester-Glass) for the development of knitted structures. Seven different knitted structures i.e. two face interlock (Kevlar + Poly-Glass), rib inlay (Kevlar with Poly-Glass inlay/ Poly-Glass with Kevlar inlay), plain interlock (Kevlar/Poly-Glass), pin tuck interlock (Kevlar/Poly-Glass) were prepared by using circular and flat knitting machines. Abrasion resistance and cut resistance tests were performed on Martindale Abrasion Tester under ISO 12947-2 and TDM-100 under ASTM F2992 respectively. Out of all these structures, rib inlay structure (Polyester-Glass with Kevlar inlay) reached maximum level (30,000 cycles) in abrasion resistance test with A-5 cut level. Polyester-Glass pin tuck interlock structure showed the lowest value of abrasion and cut resistant due to poor structure integrity.

**Keywords:** Knitted structure, Neck guard, Protective sportswear, Cut resistant

# **Evaluation of Flame Retardancy Characteristics of Ammonium Polyphosphate Modified High Performance Epoxy Composites**

**Laraib Alam Khan<sup>1</sup>, Muhammad Shafqat<sup>1</sup>, Mohsin Ali Fakhar<sup>1</sup> and Sameen Khan<sup>2</sup>**

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## **ABSTRACT**

Fibre reinforced epoxy composites are being widely used in high performance applications like aerospace, automotive and wind energy. However, one of the major drawback of these composites is their susceptibility to flammability. Curbing the flammability of epoxy composites have been the prominent research area since long. In this study, flame retardant additive ammonium polyphosphate (APP) in different ratios, is processed with high performance epoxy and then Carbon fibre reinforced composites is developed with this modified epoxy system. The flammability characteristics of Carbon fibre reinforced modified epoxy composites is assessed with UL-94 standard and then physical and mechanical characterizations are carried out. One of the undesirable factor associated with the addition of foreign material (APP in this case) is the weight gain in composites structure. So, a comprehensive study is carried out to investigate the effect of APP in weight gain and viscosity of the resin and thus resulting Composites panels. The flexural strength and Inter-laminar shear strength (ILSS) tests of the samples are conducted using ASTM D-790 and ASTM D-2344, respectively. It is observed that minimum of 20 % addition of APP (by weight) is required to qualify the V-O rating of UL-94 test. It is also observed that 20% APP in the epoxy resin enhanced the viscosity of the system, which ultimately affect the processability of composites, however, it causes the negligible weight gain with comparable mechanical properties.

**Keywords:** Flame retardant, Composites, epoxy resin, Ammonium Polyphosphate, UL-94, Flexural Strength, ILSS, V-O rating

# Development and Testing of Compression Medical Stockings

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## ABSTRACT

Compression garment are elastic clothing, provides compression to whole body or individual parts of the body (legs, feet, arms) may vary in the degree of compression depending upon requirement. These products used by different sportswear depending upon season and specifies of training for having improvement in their performance activity. Varicose Veins is bulging of veins with pools of blood when they fail to circulate blood properly. These visible and bulging veins, called varicose veins, are often associated with symptoms such as tired, heavy, or aching limbs. Compression medical stockings is a mechanical method to treat venous disorders and designed to prevent further progression of Venous disorders which include edema, phlebitis and thrombosis. Tight-fitting, elastic garment such as a sleeve or stocking used to reduce muscles fatigue, strain prevention of body, better muscles oxygenation, comfort and improved blood flow. V-shaped stockings were developed using two types of yarns Knit yarn (Nylon and single lycra covered nylon) and inlay yarn (double covered lycra) on 4-feed single cylinder circular knitting machine for class I, II and III patients. Developed specimen were tested by compression testing instrument according to RAL-GZ 387 standard for pressure measurement.

# **Think Big with Nano: Commercialization of Nanofibers Innovation**

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## **ABSTRACT**

Nanomaterials has shown a great deal of interest in nanotechnology field. The nanofibers among such materials has emerged with greater impact in recent technological development. In general, the talk will give audience insight into the Nanofibers as a new entrant in to current era that includes functional textiles, tissue engineering, drug delivery, water filtration and other agriculture applications. A broader perspective will be discussed about Nanofiber production, challenges and opportunities worldwide and more specifically in Pakistan. Our recent journey to development of innovative products and transforming into viable commercial products will be presented.

**Keywords:** Nanofibers; Entrepreneur; Nanotechnology; Commercialization of Innovation

# Continuous dyeing of cellulose electrospun nanofibrous mats with synthetic indigo dyes

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## ABSTRACT

In our study, cellulose electrospun nanofibrous mats (ENMs) were dyed with synthetic indigo dyes by continuous method for the first time. We have used the industrial scale dyeing procedure (pre-wetting, dyeing and washing-off steps). The effect of pH, concentration of sodium hydrosulphite, dye bath temperature and concentration of indigo dyes on the color strength (*K/S*) were optimized. Excellent *K/S* of dyed cellulose ENMs were achieved (reached to 13) with good colorfastness properties. For comparison, aniline-free synthetic indigo dyes were applied on the cellulose ENMs. The dyeing effluent was measured for pH, TDS, TSS and COD results. Considerable ecological merits have been found for dyeing effluent of aniline-free synthetic indigo dyes in comparison to the synthetic indigo dyes. Furthermore, the dyed samples were characterized by SEM analysis, ATR-FTIR spectroscopy, tensile strength and crease recovery angle measurements. Increase in tensile strength and crease recovery angle have found in the dyed samples comparing with undyed samples due to stiffness.

**Keywords:** Cellulose, electrospun nanofibrous mats, synthetic indigo dyes, aniline-free, continuous method.

# Graphene Oxide (GO) Dyeing Of Cotton Fabric Using Pad-Dry Cure Method; a Binder Free Approach for Wearable E-Textiles

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## ABSTRACT

The graphene is considered as promising materials for flexible electronic textiles as compared to metal-based electronic devices due to its higher strength and flexibility. The development of textile-based conductive materials is limited to mass production. Here, we used commercially available (Pad-dry Cure) technique for mass production of graphene-coated textiles without using any binder. The GO dyed cotton fabric was reduced using a green, reducing agent (L-Ascorbic acid) under microwave-assisted reduction at 90°C. The morphological and elemental characterization of the rGO coated cotton fabric was analyzed using FESEM, FTIR, XRD, Raman Spectroscopy, and XPS analysis. The resultant fabric showed exceptional electrical and mechanical performance without influencing the air permeability and breathability. The fabric showed better washing stability against 20~50 washing cycles with slight changes in sheet resistance. The electrical performance was measured before and after washing using Keithley 2-probe digital voltmeter. The results demonstrated that the sheet resistance was decreased from 185~15 KΩ with increasing the number (10-15) dyeing cycles and increased with the number of washing cycles. The study proves that the dyeing of cotton fabric with graphene oxide (GO) may reduce the production cost with increasing demand for highly flexible and conductive wearable e-textiles.

**Keywords:** Graphene, Graphene Oxide, Reduced Graphene Oxide, Wearable e-textiles, Flexible, Conductive

# **Factors Affecting Export Performance of Raw Woven Fabric Manufacturing Sector of Pakistan**

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## **ABSTRACT**

The Textile Industry of Pakistan is considered as the lifeline of the country's economy. It accounts for the nearly 55% share of the total economy. Major exports from textiles are yarns, raw and finished fabrics and also a limited quantity of value-added textile items. However, from the last one-decade, the textile industry is facing a lot of problems in terms of getting and maintaining export orders. Due to this Pakistani Textile Industry losing its competitiveness day by day resulting loss in millions of US Dollars per years. The raw woven fabric manufacturing sector lies almost in the middle of the supply line having a share of 8% in world exports. Its performance is significant for next value chain. This sector is also facing challenges in maintaining and improving its export rate which reduced from around 2.9 to 1.9 Billion US\$ in 2017 whereas world market demand is increasing. Hence deprived performance ultimately losing its competitiveness. For this internal, external factors considered as independent variables and textile Business policy as a mediator variable together taken in order to know the impact on dependent variable export performance measured in percentage. Their relationship was analyzed by using Structural equation model and found eight factors are significant at confidence internal level of 90%. The government policy showed a significant mediation effect on export performance against eight independent variables which indicated its positive role in export activities. The recommendations in terms of new product development such as tri-axial woven, multilayer innovative fabrics, new markets, fulfillment of government promises thru policy are suggested for improving export rate and remains valid for long time.

# Mineral Fiber: Basalt, Future of Composites

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## ABSTRACT

Technical textiles are new horizon for achievements in textile industry and it has become talk of the town in the recent past. Technical textiles have a variety of applications and industries. Meeting end product specification is a big challenge especially for industrial goods. The growing use of polymer composite materials in various field of technical textiles applications demands the development of products able to fulfill both technical and ever-stricter environmental requirements. Fiber reinforcements in composite material are generally used to improve the mechanical properties and environmental resistance when exposure to extreme environment takes place. The glass and carbon fibers as reinforcements in composites is of greater use as they possess excellent mechanical and thermal properties, and durability but a question is always raised when it comes to environmental issues. Mineral fibers from basalt is natural, safe and easy to recycle. Basalt fibers have good physical and chemical properties, as well as good adhesion to metals, epoxies and glues. Not only do they boast good mechanical and chemical resistance, but also exhibit excellent thermal, electric and acoustic insulation properties. Due to all these favorable properties, Basalt fiber can be used in several applications in technical textile.



# Microwave-Assisted Green Synthesis of Reactive Dyes for Digital Printing

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## ABSTRACT

In this research work, microwave-assisted synthesis, a novel strategy for the green synthesis of reactive dyes has been developed. Capillary electrophoresis and thin layer chromatography were used to monitor the synthesis reactions. Fourier transform infrared spectrometry was used for the determination of molecular structure. The microwave-assisted method has shown evident advantages when compared to conventional synthetic method for the generation of fast, efficient, and environmental friendly synthetic methodologies. The synthesized dye was formulated into an ink and applied on to wool fabric through digital printing and fixed through steaming at 102°C. These prints exhibit excellent wash and light fastness properties.

**Keywords:** Microwave-assisted synthesis, Reactive dye, Digital Printing, Wash and light fastness properties