(09-10 November 2017)

ISBN:978-969-7549-02-3

Book of Abstracts

ICTT 2017

1st International Conference on Technical Textiles

Book of Abstracts

1st International Conference on Technical Textiles (ICTT-2017)

Published by

ICTT Secretariat-2017

National Textile University,

ISBN: 978-969-7549-02-3

Address: Sheikhupura Road, Faisalabad-37610, Pakistan

Phone: (+92) 41-9230081-85

Fax: (+92) 41-9230098

Email: ictt@ntu.edu.pk

Disclaimer

The opinions and statements of facts expressed in the Books of Abstracts are entirely those of the Authors. The technical committee has reviewed and edited the abstract but do not assume any liability for any loss resulting from recommendations/suggestions contained therein.

Talha Hamdani

Dr. Talha Hamdani
Conference Secretary

Foreword

First International Conference on Technical Textiles (ICTT-2017) is organized National Textile University, Faisalabad in collaboration with Higher Education Commission, Pakistan.

The time is now right to reflect on a number of questions. Today, textile industry of Pakistan is at the crossroads of its future: Did we choose the right instruments in the crisis? Have our recovery programs had the intended effects? How can we secure lasting and sustainable growth? How do we produce long-term value creation?

The objective of this conference is to find answers to these questions. This conference is going to become one of the biggest gathering of representatives as well as experts from academia, industry and government sector to discuss how textile industry can shift to highly value added technical textiles so that exports may be enhanced.

It is an invaluable platform for the researchers and scholars of the field to share their research work about growing diversity in technology and its range of applications with Industry as well with each other. The research papers have been selected for ICTT-2017 after shear scrutiny in respect to their importance, validity and reliability. The research papers cover most of the conspicuous researches in technical textile and its related technologies, covering the main areas of technical textiles: Nonwoven, Composites, Protective textiles, functional textiles, Theoretical modelling, Medical and Healthcare, Fibers and polymers, Nanotechnologies, Smart Textiles etc.

We are thankful to all researchers and speakers from Pakistan and all around the world for their interest in presenting their research work and concern in publishing their research contributions through ICTT platform. We believe that their contribution would entail a milestone in the textiles.

At the same time, we express our gratitude to all the members of the Event Organizing Committee from National Textile University for their support in arranging and organizing this event. We are grateful to the members of Technical and Publication Committee for their valuable and endeavor in the publication process of the ICTT proceedings.

But most of all, we truly indebted to Higher Education Commission, Pakistan for realizing the importance of the conference and financial support for this case. We hope the conference immense benefit for researchers, professionals, and other involved in the worldwide innovation in Technical Textiles.

Dr. Yasir Nawab
Conference Chair

Table of Contents

Schedule of First International Conference on Technical Textiles

2017

Day 1 (Thursday) 09th November 2017

09:30-11:00	**Reception & Registration**	
Opening Session		
12:00-12:05	Recitation from Holy Quran	Mr. Hafiz Awais/Dr. Osama
12:05- 12: 10	National Anthem	
12:10-12:25	Opening Remarks/Presentation	Rector NTU
12:25 -	Address by Chief Guest	
13: 00- 14:00	**Refreshment**	
Technical Session 1. Auditorium – **Keynotes – Session Chair: Prof. Dr. Tanveer Hussain**		
14:00-14:30	CPEC: An Opportunity for the Establishment of Technical Textiles Sector in Pakistan	Prof. Tahir H Shah, United Kingdom
14:30-15:00	Technical Textiles: way forward for weaving industry of Pakistan	Muhammad Ayub Asghar, Pakistan
15:00-15:30	Driving Innovation and Entrepreneurship with Smart Textiles	Qaizar Hassonjee, USA
15:30-16:00	Light side emitting textile linear composites	Prof. Jiří Militký, Czech Republic
16:00 -16:20	**Tea Break**	
Technical Session 2a. Room 1 – **Textile Composites - Session Chair: Prof. Jiří Militký**		
16:20 -16:50	Development of Lightweight and High-performance Thermoplastic Composites Reinforced with Polyimide Fiber or Textile	Prof. Xiaodong Wang, China
16:50 -17:10	Development of equipment for testing ballistic materials against low velocity projectile Impact	Abdul Waqar Rajput, BZU
17:10 -17:30	Effect of crimp in fabrics used for carbon-epoxy composites	Rizwan Hussain, NESCOM
17:30 -17:50	Jute fibers reinforced thermally activated polymer composite actuators	Abdul Basit, NTU
Technical Session 2b. Room 2 – **Smart Textiles - Session Chair: Prof. Tahir H Shah**		
16:20 -16:50	Lurex: the success to promote this high value yarn in competitive textile market	Kit Blake MD Lurex, UK
16:50 -17:10	Process of functional hybrid spun yarns containing metallic fibers for EMI shielding fabrics	Amir Shehzad, NTU

17:10 -17:30	Fabrication of Flexible and Conductive Cotton Fabric Electrode	Iftikhar Ali Sahito, MUET
17:30 -17:50	An electrospun nanofibers based piezoelectric nanogenerator; energy harvesting and storage under high loading for a self-powered wearable sensor system	Saqib Siddiqui, BUITEMS
Technical Session 2c. Room 3 – **Textile Processing – Session Chair: Dr. Awais Khatri**		
16:20 -16:50	Recent advances in Thermal spray technologies & Coatings	Muhammad Yasir, IST
16:50 -17:10	Comparative Efficiency of Triethanol Ammonium Sulfamate and Toluene diisocyanate to Improve the Cross-Linking of Melamine Formaldehyde Resin for Pigment Prints on Cotton Fabric	Muhammad Atif, NTU
17:10 -17:30	The polyelectrolyte behavior of cellulose solutions in N, N-dimethyl acetamide and lithium chloride	Zubair Khaliq, NTU
17:30 -17:50	Dyeing of Wool Fabric with Natural Dye Extracted from Leaves and Stem Bark of Dalbergia Sisso	Muhammad Jawad Ul Rehman, NTU

Day 2 (Friday) 10th November 2017

Technical Session 3a. Room 1 – **Textile Composites - Session Chair: Xiaodong Wang**		
09:30 -10:00	Online Structural Health Monitoring of Composite Structures using Smart Sensors	Muhammad Ali Nasir, UET Taxila
10:00 -10:20	Study of functional characteristics of woven/knitted hybrid textile composite	Usman Ahmed, UMT
10:20 -10:40	Development of multilayer impact resistant fabric on a hand loom	Kanwar Haider, UMT
10:40 -11:00	Study of structural performance and durability of textile reinforced concrete	Hafsa Jamshaid, NTU
11:00 -11:20	Mechanical behavior of nanocellulose coated jute/green epoxy composites	Abdul Jabbar, NTU
11:20 -11:40	**Tea Break**	
Technical Session 3b. Room 2 – **Smart Textiles - Session Chair: Dr. Qaizar Hassonjee**		
09:30 -10:00	Development of flexible and textile supercapacitors based on synergetic redox effect between electrode and electrolyte	Prof. Xiuguo Cui, China

10:00 -10:20	Smart Textiles: An elegant approach to Hybrid design process	Syed Zameer Ul Hassan, BUITEMS
10:20 -10:40	Thermo-Electrical Modelling of Test-Rig for the calibration of Temperature Sensing Fabric in MATLAB Simscape environment	Muhammad Dawood Husain, NED
10:40 -11:00	Characterization of conductive threads for heating textiles	Mariam Jabbar, NTU
11:00 -11:20	Processing and development of multifunctional yarns and fabrics for interactive gloves	Bilal Qadir, NTU
11:20 -11:40	**Tea Break**	
Technical Session 4a. Room 1 – **Medical Textiles – Session Chair: Dr. Rehan Abbasi**		
11:40-12:10	Recent developments and potential applications of bacterial polyesters	Z A Raza, NTU
12:10 -12:30	A study to Develop and Characterize the Highly Absorbent Antimicrobial Alginate Fibers for Wound Dressings	Abdul Rehman, NTU
12:30 -12:50	Functionalization of Cotton Fabric Imparting Mosquito Repellency, UV Protection and Antimicrobial Potential Using Seven Selected Plants	Tahir Hussain, NTU
12:50 -13:10	Production of PLA integrated chitosan nanocomposites for improved functional properties of cotton fabric	Faiza Anwar, UMT, Lahore
13:10 -14:20	**Lunch**	
Technical Session 4b. Room 2 – **Textile Processing – Session Chair: Dr. Zulfiqar Ali**		
11:40-12:10	Functional Polymers for Applications in the Technical Textile Industry	Nasir M. Ahmad, NUST
12:10 -12:30	Chemical surface modification of commercial polyester film for improved hydrophilic and adhesion properties	Hafiz Affan Abid, NTU
12:30 -12:50	Functional finishing of textiles for technical applications	Awais Khatri, MUET
12:50 -13:10	Cationic Starch (Q-TAC) Pre-Treatment of Cotton Fabric: Influence on dyeing with reactive dye	Shamshad Ali, MUET
13:10 -14:20	**Lunch**	
Technical Session 4c. Room 3 – **Supply Chain/Misc. Session Chair: Dr. Muhammad Abrar**		

11:40-12:10	Spunbond technical textiles in Pakistan: project cost and profitability projections	Rehan Abbasi, BUITEMS
12:10 -12:30	Investigating the impact of GSP plus Status: Intellectual capital and firm Performance in Textile Industry of Pakistan	Fiza Amjed, NTU
12:30 -12:50	Export Competitiveness of Pakistan's Textile Goods to European Union (EU): Constraints and Opportunities	Javaria Tabassam, NTU
12:50 -13:10	Determinants of Garments Sector Exports in Pakistan: An Econometric Analysis	Mahum Hira, NTU
13:10 -14:20	**Lunch**	
Technical Session 5a. Room 1 – **Textile Comfort / Eco-Textiles – Session Chair: Dr. Zameer Ul Hassan**		
14:20-14:50	Why nanofibers are the better choice for technical textile applications?	Zeeshan Khatri, MUET
14:50 -15:10	Filtration and Comfort Properties of Face Masks Containing Polyamide Electro-spun Nanowebs	Ahsan Nazir, NTU
15:10 -15:30	Investigation of comfort properties of flame resistant fabrics	Uzair Hussain, NTU
15:30 -15:50	Preparation of anti-microbial finishes by Eco-friendly method from peel of citrus fruit (lemon) and analyze anti-microbial activity on cotton fabric	Awais Yasin, BUITEMS
15:50 -16:10	Carbon foot prints of cotton cultivation	Ali Shan Arif Makhdum, WWF
16:15 - 16: 35	**Closing Ceremony**	
Technical Session 5b. Room 2 – **Technical yarns/fabrics / Image processing – Session Chair: Dr. Muhammad Zubair**		
14:20-14:50	Development of NIR camouflage fabric by using carbon black polyester	Zulfiqar Ali, NTU
14:50 -15:10	Techno-mechanical properties of cocoon filament of mulberry silkworm (Bombyx mori L.) strains	Ghulam Ali Bajwa, PFI
15:10 -15:30	Normal Needleless Electrospinning and Induced Needleless Electrospinning	Usman Ali, BZU

15:30 -15:50	Use of Bag of Visual Words Model for Textile Image Classification and Retrieval	Muhammad Naeem, NTU
15:50 -16:10	A Review of Analysis and Control of Yarn Faults	Awais Ahmed, NTU
16:15 - 16: 35	**Closing Ceremony**	

Participating Organizations


AHMAD JAMAL
Aspen
www.aspentextile.com
alkaram
Anwar & sons
ARSHAD GROUP
ARCHROMA
LIFE ENHANCED
AKC COMPOSITES
1978
Chenab LIMITED
BUCT
Fatima
Fertilizer Company Limited
Friends MFG Group
More Light
PTEA
APTPMA
PHMA
SIALKOT CHAMBER OF COMMERCE & INDUSTRY
SCCI
Ghauree & Co.
Happilac
COLORS OF HAPPINESS
HABIB
Image Garments (Pvt.) Ltd.
interloop
KAY & EMMS
PRIVATE LIMITED
KAMAL
TEXTILE MILLS (PVT) LTD.
Jamal Fabrics (Pvt) Ltd.


PUMA
Outfitters
MIDAS SAFETY
Prideline Industries
NISHAT CHUNIAN LTD.
NIZAM SONS(PVT)LT
NRS International
Saeed FABRICS
PUNJAB IMPEX
Sapphire
standard
Sitara Group Of Industries
STYLE TEXTILE
society of dyers and colourists Pakistan
SHARIF
WWF
TECHNICAL UNIVERSITY OF LIBEREC
TANVEER
VISIGMA APPAREL GROUP
Technical TEXTILES
Z.A. International
YEOP Young Entrepreneurs Organization Pakistan
YUNUS TEXTILES FOR LIFE
Fatima Fertilizer Company Limited
FCM
Sadaqat CORPORATION (PVT) LTD

Steering Committee

Patron in Chief	**Prof. Dr. Tanveer Hussain (Rector), National Textile University, Faisalabad**
Chairman	**Dr. Yasir Nawab** (Assistant Professor) Department of Weaving, Director Graduate Studies and Research, National Textile University, Faisalabad
Conference Secretary	**Dr. Syed Talha Ali Hamdani** (Assistant Professor) Department of Weaving, Faculty of Engineering & Technology, National Textile University, Faisalabad
Co-Chairman (Technical)	**Dr. Zulfiqar Ali** (Assistant Professor) Department of Yarn Manufacturing, Faculty of Engineering & Technology, National Textile University, Faisalabad
Co-Chairman (Logistics)	**Dr. Abher Rasheed** (Assistant Professor) Department of Garment Manufacturing, Faculty of Engineering & Technology, National Textile University, Faisalabad
Co-Chairman (Publication/Advertisement)	**Dr. Munir Ashraf** (Assistant Professor) Department of Textile Processing, Faculty of Engineering & Technology, National Textile University, Faisalabad
Co-Chairman (On day arrangements)	**Dr. Sheraz Ahmed** (Assistant Professor) Department of Materials & Testing, Faculty of Engineering & Technology, National Textile University, Faisalabad
Co-Chairperson (Media Cell)	**Dr. Hafsa Jamshaid** (Assistant Professor) Department of Knitting, Faculty of Engineering & Technology, National Textile University, Faisalabad

Technical Committee

Prof. Dr. Tanveer Hussain

(Rector), National Textile University, Faisalabad

Dr. Yasir Nawab

(Assistant Professor) Department of Fabric Manufacturing, Convener ILIC (Industry Liaison, Innovation & Commercialization)

National Textile University, Faisalabad

Dr. Syed Talha Ali Hamdani

(Assistant Professor) Department of Weaving, Faculty of Engineering & Technology, National Textile University, Faisalabad

Dr. Zulfiqar Ali

(Assistant Professor) Department of Yarn Manufacturing, Faculty of Engineering & Technology, National Textile University, Faisalabad

A Review of Analysis and Control of Yarn Faults

Awais Ahmad[1], Muhammad Asif[1,*] , Syed Talha Ali Hamdani[2], Waqar Ahmad[1]

[1] Department of Computer Science, National Textile University, Faisalabad, Pakistan

[2] Department of Weaving, National Textile University, Faisalabad, Pakistan

awaisahmad435@yahoo.com

Abstract

Yarn faults put deep negative effect on yarn and if will remain undetected before weaving process then produced cloth mostly rejected from buyers because of having lower quality. There are different types of yarn fault those occurred during spinning process like yarn unevenness, hairiness, twist and snarl. In this study, we have tried to cover most recent research on all these types of faults specifically by the use of image processing techniques. Many researchers proposed novel approaches for the detection and control of these faults, are part of our study.

Keywords: yarn faults, yarn evenness, yarn hairiness, yarn twist and snarl, image processing

* Corresponding Author: asif@ntu.edu.pk

A study to Develop and Characterize the Highly Absorbent Antimicrobial Alginate Fibers for Wound Dressings

Shagufta Riaz[1], Munir Ashraf[1], Abdur Rehman[1,*], Kashif Iqbal[1], Amjed Javid[1], Abdul Basit[2], Tanveer Hussain[1]

[1]Department of Textile Processing, National Textile University, Faisalabad, Pakistan

[2]Department of Yarn Manufacturing, National Textile University, Faisalabad, Pakistan

Presenter: rehmansharif@hotmail.com

Abstract

In this study alginate fibers were developed by replacing sodium ions of sodium alginates with ions having antibacterial properties such as zinc and copper. Fibers were investigated for liquid absorption, ion release and antibacterial properties. It has been observed that absorbency was affected by fiber composition and release of ions affected by solution physiology and contact time. Fibers showed excellent antibacterial activity against Gram-positive and Gram-negative bacteria i.e. staphylococcus aureus and Escherichia coli. Zinc alginate fibers showed relatively higher absorbency, higher release of ions and higher bacterial inhibition zone as compared to copper alginate fibers.

Keywords: alginate fibers; absorbency; antibacterial activity; copper ions; zinc ions

* Corresponding Author: rehmansharif@hotmail.com

An Electrospun Nanofibers based Piezoelectric Nanogenerator; Energy Harvesting and Storage under High Loading for a Self-Powered Wearable Sensor System

Saqib Siddiqui[1]

[1]Department of Textile Engineering, Baluchistan University of Information Technology, Engineering & Management Sciences, Quetta

Presenter: Saqib.siddiqui@buitms.edu.pk

Abstract

Real-time applications of nanofibers based piezoelectric Nanogenerators (PENGs) under severe conditions like high loads, are under constrained due to the significantly lower mechanical durability of conventional piezoelectric materials. Mechanical strength and high performance are obstacle for the real-life applications of PENGs. Herein, we report the fabrication of a mechanically robust and high performance lead-free piezoelectric nanocomposite consist of electrospun nanocomposite nanofibers of barium titanate nanoparticles (BT NPs) and poly(vinylidene fluoridetrifluoroethylene) (P(VDF-TrFE)). The fabrication and characterization of a durable PENG based on nanocomposite nanofibers rooted in an elastomer are demonstrated for human body energy harvesting during walking. By integrating inside of a shoe, a nanofiber PENG (nf-PENG) can produce an open-circuit voltage of 24 V during walking under very high loads of about 600 N. The harvested energy from walking can be stored in a small commercial

capacitor after approximately each 80 steps. The stored charges were used to operate a strain sensor without any external power supply. The high performance of the nf-PENG is predominantly ascribed to the highly piezoelectric nanocomposite nanofibers. Additionally, implanting the nanofibers into an elastomer provided high flexibility by shielding the nanofibers from mechanical damage. Moreover, the features of small form factor, flexibility, and transparency make this nf-PENG fitting for applications in wearable electronics. This work confirms the opportunity of highly robust, efficient, and self-powered wearable sensing systems suitable for harsh environments.

Keywords: electrospinning, piezoelectric nanogenerator, nanocomposite nanofibers,

biomechanical energy harvesting, self-powered sensing systems

Capacitive based Soft Strain Sensor

Ozgur Atalay[1]

[1]Istanbul Technical University, inönü Caddesi, No: 65 Gümüssuyu (34437) - Beyoğlu, Istanbul, Turkey

atalayoz@itu.edu.tr

Abstract

This paper presents design and characterization of interdigital capacitive based soft and stretchable sensor. The developed sensor consists of conductive knit fabric and silicone elastomer. Electrodes of the sensor are placed onto silicone elastomer base to construct sensing system. Proposed capacitive sensors exhibit high linearity, fast response time and a gauge factor of 0.83. The devised sensors are good candidates for the wearable electronic systems due to their flexible and compliant nature.

Keywords: capacitive sensor, soft sensor, strain sensor, wearable electronics

Carbon foot prints of cotton cultivation

Ali Shan Arif Makhdum[1]

[1]World wide Fund for Nature (WWF), Pakistan

asamakhdum@wwf.org.pk

Abstract

In Pakistan, approximately 1.3 million farmers cultivate cotton over 3 million hectares, which is 15 per cent of the total cultivable area of the country. This cotton is mainly utilized for making fabrics. There are about 1545 textile processing SMEs, of which the majority are situated in the Punjab province (1395 respectively). Textile is the largest industrial sector of Pakistan with respect to production, export and labour force employment. Pakistan is the 8th largest textile products exporter from Asia and 12th globally; it contributes 8.5% of the country's GDP and 52% in exports. Cotton cultivation is generally characterized as unsustainable due to excessive and overuse of some key resources such as fertilizers, pesticides, water for mostly flood irrigation, similarly fuel for pumps and motor operations, tillage machineries and transportation.

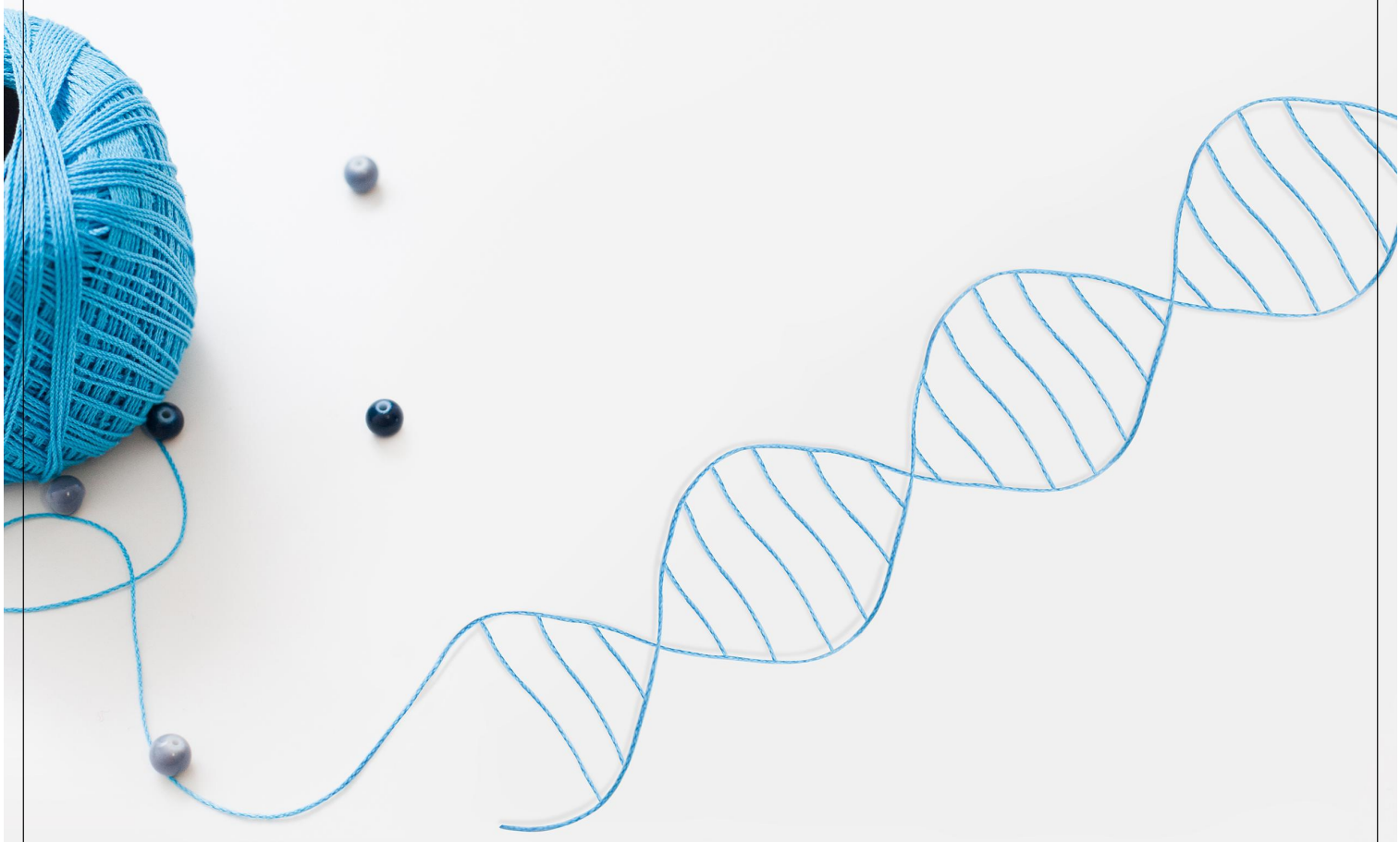
Bahawalpur is the major cotton growing region of the southern Punjab. Results of a study conducted to assess the carbon foot prints of cotton cultivation in Bahawalpur district are summarized in preceding paragraph. Cotton cultivable area was divided into 4 categories i.e. Category A (less than 12 acres), Category B (12.1 to 25 acres), Category C (25.1 to 38 acres), Category D (38.1 to 50 acres). A total of 100 farmers, with 25 farmers in each category were selected at random. Average carbon foot prints of agro chemicals, livestock and agro machineries

for (i) Category A were 22585.9 Kg CO2eq, 8699 Kg CO2eq and 603 Kg CO2eq. (ii) Category B were 72,401.3 Kg CO2eq, 15,916.4 Kg CO2eq and 1,466.8 Kg CO2eq. (iii) Category C were 148,251.6 Kg CO2eq, 18,816.4 Kg CO2eq and 5,484.4 Kg CO2eq and (iv) Category D were 435,988.1 Kg CO2eq, 21,716.4 Kg CO2eq and 5,448.8Kg CO2eq respectively. The study showed that carbon foot prints of agrochemicals increased exponentially with increase in farm size.

iTextiles®

REDEFINING TEXTILES

iTextiles Pvt. Ltd., is a leading textiles marketing company in Pakistan, representing premium textile products of international companies. With innovative ideas, international standards and high quality products, we are changing the face of texiles in pakistan.



XFIT TECHNOLOGY BY LYCRA®

dualFX® TECHNOLOGY BY LYCRA®

LYCRA® beauty

T400® TECHNOLOGY BY LYCRA®

COOLMAX®

THERMOLITE®

CORDURA® FABRIC

LUREX®

silvadur™ The Science of Intelligent Freshness

NaturTec™

Protex®

DSM Dyneema recognizes iTextiles (Pvt) Ltd for consistently bringing innovative and top-quality products to market – and pursuing technical excellence within a broad product portfolio.

APXPRESS

NEWSTAR

Taparan®

Left Wing, 2nd Floor, Bahria Complex - IV, Main Khaliq-uz-zaman Road, Gizri, Clifton, Karachi, Pakistan
Email: info@itextiles.com.pk Ph: (9221) 35147784-92 Fax: (9221) 35147797 Website: www.itextiles.com.pk

Cationic Starch (Q-TAC) Pre-Treatment of Cotton Fabric: Influence on dyeing with reactive dye

Shamshad Ali[1] and Mazhar Hussain Peerzada[1]

[1] Department of Textile Engineering, Mehran University of Engineering and Technology, Jamshoro 76060, Pakistan

shamshad.ali@faculty.muet.edu.pk

Abstract

Reactive dyes require high concentrations of an electrolyte to improve dye-fiber interaction, leading to the discharge of harmful effluent. One approach to reduce this unsafe release is treatment of the cotton fabric with cationic chemical reagents. This paper reports on the treatment of cotton fabric with cationic starch (Q-TAC), a commercial product, by batchwise method and pad batch method for the first time prior to reactive dyeing process. Furthermore, a commercial reactive dye, based on mono-chloro triazine chemistry, was applied on the cotton fabrics by continuous (pad-dry-cure) method. The treated cotton fabric by batchwise method produced 70% higher color yield (K/S) and 20% enhanced dye fixation (%F) than untreated cotton fabric. X-ray photoelectron spectrometer (XPS) analysis revealed the presence of N1s peaks in the treated cotton fabrics. The crystallinity of treated cotton fabrics was reduced in comparison to untreated cotton fabric as revealed by Wide Angle X-ray diffraction (WAXD) measurements. Field Emission Scanning Electron Microscopy (FE-SEM) showed that the surface of treated cotton fabrics was rougher than untreated cotton fabric due to the deposition of cationic starch. Attenuated total reflectance-Fourier

transform infrared (ATR-FTIR) spectrum confirmed the existence of quaternary ammonium groups, N+(CH3)3, in the treated cotton fabrics. The analysis of color fastness tests demonstrated good to excellent ratings for treated cotton fabrics. In this way, cationic starch treatment of cotton fabric before reactive dyeing process has been proven potentially a more environmentally sustainable method than conventional dyeing method.

Keywords: reactive dyes, cationic chemical reagents, cationic starch, color yield, dye fixation

Characterization of Conductive Threads for Heating Textiles

Mariam Jabbar[1], Abher Rasheed[1,*], Nasir Mehmood[2], Ali Afzal[3], Nauman Ali[1]

[1] Garment Manufacturing Department, National Textile University, Faisalabad, Pakistan

[2] Computer Science Department, National Textile University, Faisalabad, Pakistan

[3] Material and Testing Department, National Textile University, Faisalabad, Pakistan

maryamjabbar@ntu.edu.pk

Abstract

Choosing a conductive thread for a certain application can be a challenge. Selection of conductive thread vary with the requirements of a product. Mostly rechargeable batteries are used as a power source in heating textiles. It is extremely important to study the behavior of a certain thread. This research was conducted on 7 different threads from two different suppliers. Input variables were thread length, electrical resistance per unit length, sewing pattern and temperature while voltage and current were the output variables. Five levels of thread length, 7 levels of electrical resistance per unit length, three levels of sewing pattern and three levels of temperature were considered. DC power supply was used as a source and a thermocouple was used to determine the temperature. Data was collected and statistical analysis was carried out. It was observed that threads with low

* Corresponding Author: abher.rasheed@ntu.edu.pk

resistance exhibit high current drop with low voltage but the threads with high resistance exhibits low current drop with higher voltages.

Keywords: conductive thread, heating textiles, electrical resistance, voltage, current, temperature

Chemical Surface Modification of Commercial Polyester Film for Improved Hydrophilic and Adhesion Properties

Hafiz Affan Abid[1,2], Jakub Wiener[1], Syed Qummer Zia Gilani[1,2] Zubair Khaliq[2], Amir Shahzad[2], Abdul Jabbar[2,*]

[1] Department of Textile Technics & Material Engineering, Technical University of Liberec, Studentska 1402/2, Liberec, Czech Republic

[2] Faculty of Engineering &Technology, National Textile University Faisalabad, Pakistan

affanabid2001@gmail.com

Abstract

Surface modification of commercial polyester film is carried out by acid hydrolysis followed by alkaline treatment in aqueous solution. Surface hydrolysis at the surface gives a super hydrophilic surface with enhanced adhesion properties. The commercial polyester film Mylar™ of 30 µm in thickness was used in this work and hydrolysis time of sulpuric acid and sodium hydroxide is the main parameter for modification. SEM topographic measurements, contact angle (CA) measurements, surface free energy (SFE) and T-peel adhesion test is carried out for characterization of modified film. It was shown that the acid treatment increases the roughness of the surface of film. The sodium hydroxide hydrolysis increases the surface free energy and specific

* Corresponding Author: abduljabbarntu@gmail.com

surface area of the polymer film. The T-peel adhesion strength for modified film is higher than that of unmodified film. The contact angle is decreased to 45.50 by synergistic effect of 80 % sulphuric acid for 3 sec and 50 g/l sodium hydroxide treatment for 6 min and it is almost 50 % less than the unmodified film.

Keywords: surface hydrolysis, polyester film, super hydrophilic surface

Combined Easy-Care and Water Repellent Finishing of Cotton Fabrics Using Plasma Treatment

Ahsan Nazir[1], Muhammad Bilal Qadir[1], Abdul Jabbar[1], Hafiz Affan Abid[1], Zubair Khaliq[1], Ali Afzal[1,*]

[1] Faculty of Engineering & Technology, National Textile University, Faisalabad, Pakistan

ahsan.nazirr@gmail.com

Abstract

Plasma is a fourth state of matter and is a combination of gasses and ions. Plasma treatment utilizes ionized species to modify the surface of different materials, including textiles. It is a green option to process textile materials and is expected to reduce the environmental impact of different textile processes. Current study uses this technique to improve the pickup of 100 % cotton woven fabric for its combined easy-care and water repellent finishing, as such process needs the fabric to be highly absorbent that is normally achieved by treating it with environmentally harmful chemical agents such as surfactants. The intensity of plasma treatment was varied using different treatment times and different finishing recipes were applied to observe the improvement in their performance. The results of this study show that plasma treatment is a strong option to carry out waterless preparation and in this way, economical, robust and well controlled textile processes may be designed for processing of textile goods.

* Corresponding Author:

Keywords: plasma, easy-care, water repellent, waterless, finishing

Comfort Properties of Nano-Filament Polyester Knitted Fabric

Musaddaq Azeem[1], Antonin Havelka[1]

[1] Technical University of Liberec, Faculty of Textile Engineering, Studentska 1402/2, 461 17, Liberec 1, Czech Republic

musaddaqazeem@yahoo.com

Abstract

The aim of this research is to analyze comfort properties i.e. thermo-physiological, wicking and sensorial properties of newly developed warp knitted fabrics. Warp knitted fabric is comprised of nano sized multi-filaments was compared with available cotton and coolmax fabrics. Thermo-physiological properties i.e. thermal conductivity and absorptivity, Wicking and total hand value of all the three fabrics were compared and found significant change in nano sized multi-filaments warp knitted fabrics. In this research, we concluded that nano sized multi-filaments exhibit highest thermal absorptivity value and wicking than coolmax and cotton knitted fabrics. As far thermal conductivity is concerned, it was better than cotton fabric but lower than coolmax fabric sample. The higher total hand value (THV) resulted in lower stiffness (Koshi), and higher smoothness (Numeri) and fullness (Fukurami). Total hand value of nano-filament polyester fabric was found best as compared to other fabric samples.

Keywords: capacitive sensor, soft sensor, strain sensor, wearable electronics

Comparative Efficiency of Triethanol Ammonium Sulfamate and Toluene diisocyanate to Improve the Cross-Linking of Melamine Formaldehyde Resin for Pigment Prints on Cotton Fabric

Rafaquat Javed[1], Shaukat Ali[1], Muhammad Tahir Hussain[2,*], Muhammad Atif[1] and Sadia Noureen[1]

[1] Department of Chemistry, University of Agriculture, Faisalabad, Pakistan

[2] Department of Applied Sciences, National Textile University, Faisalabad, Pakistan

atif

Abstract

In pursuit of enhancing the quality of pigment prints on cotton fabric, a comparative study of two cross-linking catalysts: triethanol ammonium sulfamate and toluene diisocyanate for MF (melamine-formaldehyde) resin was conducted. Other chemical auxiliary agents including acrylate binder and acrylic thickeners were added as per ISO methods. The cross-linking catalysts were added in MF resin prior to its addition in pigment printing paste. After taking pigment prints, wet and dry fastness of treated and control samples were evaluated and their colorimetric attributes (L*, a*, b*, C, & h) were also explored. Improved printing quality was obtained at 4% acrylic thickener, 15% acrylic binder, and 2% modified melamine formaldehyde resin under 150±5°C temperature.

* Corresponding Author: mtahirhussain@gmail.com

Keywords: MF resin, cross-linking catalyst, binder, thickener, ISO methods

CPEC: An Opportunity for the Establishment of Technical Textiles Sector in Pakistan

Professor Tahir H Shah [1]

[1] Institute for Materials Research and Innovation, The University of Bolton, Bolton, UK

tahirhshah@yahoo.com

Abstract

In 2013, the Chinese president Xi proposed an estimated $5 trillion infrastructure development program across more than sixty countries in Asia, the Middle East, Europe and Africa. One of the major projects included in the program is the US$46 billion China-Pakistan Economic Corridor (CPEC), which is a framework of regional connectivity. CPEC will not be beneficial only for China and Pakistan but will also have strong impact on the development of economies in the surrounding region. The project is mainly related to the development of transport and energy: roads, bridges, gas pipelines, ports, railways, and power plants. Nearly all the infrastructure development programs will require the use of Technical Textiles of different types. China is making major investments in the Technical Textile sector, which will be ready to make its contribution when the CPEC program is in full flow. The Pakistan Textile industry need to get its act together in order to benefit from this huge opportunity and must focus on the development of the Technical Textile sector. This keynote lecture will highlight and focus on the major geotechnical textiles products, such as geotextiles and geogrids, which will be important for the development CPEC infrastructure.

Determinants of Garments Sector Exports in Pakistan: An Econometric Analysis

Mahum Hira[1], Asghar Ali[1], Muhammad Usman[2], Sajjad Ahmad Baig[2], Muhammad Zia-Ur-Rehman[2] and Muhammad Hashim[2]

[1] Institute of Agricultural and Resource Economics, University of Agriculture Faisalabad-Pakistan.

[2] Department of Management Sciences, National Textile University, Faisalabad-Pakistan.

asghar.ali@uaf.edu.pk

Abstract

Pakistan could experience a colossal growth through focusing on garments sector exports. Pakistan's garments sector contributes about 1.81 percent in global textile market. This study was conducted to envisage the determinants of textile sector export in Pakistan. Time series data from 1980-2015 were taken from various sources. Upon the basis of stationarity of study variables Econometric analysis was finalized. Auto Regressive Distributed Lag Model, Bound Test, and Forecasting tests were applied for data analysis purpose. Results of ARDL test exhibited that coefficient of electricity consumption, foreign direct investment, cotton production; number of total units installed in industrial sector, and exchange rate were significantly (positively) contributing toward garment sector export of Pakistan. It represented a positive connection among all of these study variables and climb in exports of country's garments sector. Results for forecasting tests revealed that coefficients of the model are not varying overtime and stable in nature. Hence, it can be argued that coefficients are stable in nature and parameters of the model

are desirable. The study concluded that uninterrupted electricity supply at economic cost should be provided to industrial sector. This will give a boost to production in textile sector and lead to augment competitive behavior of Pakistan's export in world market.

Keywords: garments, exports, determinants, auto regressive distributed lag model, bound test, forecasting, Pakistan

Development of Energy Harvesting Knitted Structures

Rizwan Tahir[1], Muhammad Dawood Husain[2], Syed Talha Ali Hamdani[1,*], Yasir Nawab[1]

[1] Department of Weaving, National Textile University, Faisalabad, Pakistan

[2] Textile Engineering Department, NED University of Engineering & Technology, University Road, Karachi, Pakistan

dawood@neduet.edu.pk

Abstract

In recent years alternative, renewable energies have gained an importance as the traditional sources of energies might deplete in next few decades. In this regard, piezoelectric materials such as quartz, PVDF, PZT etc. can be significantly helpful to overcome the energy crisis. Piezoelectric materials generate electricity on getting deformed by mechanical stimuli. Currently there are many applications of piezoelectric material such as sensors, actuators, piezo tiles, ultrasonic transducers, sports equipment etc. This study presents the development of knitted structure by the use of commercial available PVDF and Cotton yarn. The standard single and double jersey structures were made on the manual flat-bed knitting machine. Cotton yarn is used on both ends for insulating purpose, while PVDF yarn is used as piezo material. The structures were studied under different extension frequency and different expanding length. Tests were performed on a Universal Tensile Tester while voltage measurements were recorded through the hand-held USB multimeter. The double jersey structures showed better results in comparison to the single jersey structures. The

* Corresponding Author: hamdani.talha@ntu.edu.pk

double jersey structure could able to generate the voltage of 4.5mV, upon the cycle loading, which could be used to charge the handheld devices like mini wireless or Bluetooth.

Keywords: renewable energy sources, piezoelectric material, PVDF, smart textiles, knitted structures

Development of Equipment for Testing Ballistic Materials against Low Velocity Projectile Impact

Abbdul Waqar Rajputa[1]

[1] College of Textile Engineering, BZU, Multan 60800, Pakistan

waqar.rajput@bzu.edu.pk

Abstract

One of the limitation in the development of ballistic materials in Pakistan is unavailability of the equipment to test ballistic properties. The testing facilities available can carry out only commercial test such as NIJ standard test. However, the research demands more qualitative results than the results given by NIJ standard test. To test ballistics properties of the materials quantitatively light gas air guns are used. Light gas air gun is a complicated piece of equipment and requires many complex settings to achieve predetermine velocity. The availability of the light gas air gun is very limited therefore there was a dire need to develop an equipment which can help researchers to develop ballistic materials models by providing quantitative results. In this research an equipment was develop which utilizes compressed air as propellant for projectile. The equipment can measure the ballistic properties of the material at the speed of upto 800fps at present. The projectile of predetermine weight is shot at the sample the projectile is allowed to pass through the sample. The equipment is equipped with the velocity measuring devices that measure the velocity of projectile before it hits the samples and also after it passes the sample. The reduction in projectile velocity is used to determine the energy absorption/dispersion by the samples at certain speed.

Keywords: impact resistance, projectile resistance, composites

Development of Flexible and Textile Supercapacitors based on Synergetic Redox Effect between Electrode and Electrolyte

Xiuguo Cui [1]

[1] Beijing Key Lab of Special Elastomer Composite Materials, Department of Functional Materials, Beijing Institute of Petro-Chemical Technology, Beijing 102617, China

cuixiuguo@bipt.edu.cn

Abstract

With the development of the flexible electronics, flexible supercapacitors show great potentials for many applications, such as flexible display, energy storage system and wearable electronics. As the energy storage device, the flexible or textile supercapacitors receive serious attentions from the academics and industry. This present will give the development status of various types of flexible or textile supercapacitors, including the research progress of the selection of current collector, electrodes, electrolytes and smart design of the electrochemical system.

Just as conventional supercapacitors, flexible and textile supercapacitors often meet some technique challenges such as insufficient energy density that compared to ion batteries. Increasing either or both capacitance and work voltage is a short cut to enhance the energy density because of the energy density is proportional to the capacitance and the square of the voltage. In addition to the efforts in increasing the operating cell voltage, the enhancement of the capacitance by improving electrode materials has been largely reported. In fact, the electrolyte is closely related to both the cell voltage and capacitance of supercapacitors. Recently, an innovative technique to elevate the capacitance has been researched by introducing redox-active compound into electrolyte

solution. Here, we present a series of electrochemical combination of redox electrolyte and redox polymeric electrode with high performance and flexible by a synergetic effect.

Development of Lightweight and High-performance Thermoplastic Composites Reinforced with Polyimide Fiber or Textile

Le Zhang[1], Xiaodong Wang[1] and Dezhen Wu[1]

[1] State Key Laboratory of Organic–Inorganic Composites, Beijing University of Chemical Technology, Beijing 100029, China

wangxdfox@aliyun.com

Abstract

Polyimide (PI) fiber is a type of high-performance organic fiber with high tensile strength, high reliability and durability, nonflammability, good UV/radiation resistance and lightweight feature, and it has been widely used for. This work focused on the development of lightweight and high-performance thermoplastic composites with PI fiber or textile through a long fiber reinforcing technology. A series of poly(butylene terephthalate) (PBT)- and nylon6-based composites with long PI fiber were prepared via a melt-pultrusion process. Mechanical characterizations revealed that the obtained composites achieved significant improvements not only in tensile and flexural strength but also in impact toughness. It is highlight that the Izod impact strength was improved by a factor of five when 12 wt % PI fiber was incorporated into these two engineering plastics. Morphological investigation indicated that the fiber pullout is the dominant mechanism for tensile failure, whereas the enhancement of impact toughness is attributed to the energy dissipation by both the fiber pullout and fiber strain. In this case, a simple fiber strain energy model can be used to predict the impact strength of this composite system. The theoretical results showed a good fit with the experimental data of impact energy due to the fiber strain energy absorption involved in

the major dissipation of impact energy. In addition, the incorporation of PI fiber cannot only enhance the crystallinity of PBT and nylon 6 due to the heterogeneous nucleating effect but also improves the thermal stability of composites by promoting the carbonization of the matrix. As a result of this study, the lightweight and high performance thermoplastic composites with an organic reinforcing fiber were created for engineering and structural applications.

Keywords: thermoplastic composites, long fiber reinforcement, polyimide fiber and textile; lightweight; tensile strength

Development of Multilayer Impact Resistant Fabric on a Hand Loom

Kanwar Haider [1]

[1] School of Textile and Design, University of Management and Technology Lahore

kanwar.haider@umt.edu.pk

Abstract

This paper presents design and characterization of interdigital capacitive based soft and stretchable sensor. The developed sensor consists of conductive knit fabric and silicone elastomer. Electrodes of the sensor are placed onto silicone elastomer base to construct sensing system. Proposed capacitive sensors exhibit high linearity, fast response time and a gauge factor of 0.83. The devised sensors are good candidates for the wearable electronic systems due to their flexible and compliant nature.

Keywords: capacitive sensor, soft sensor, strain sensor, wearable electronics

Development of NIR Camouflage Fabric by using Carbon Black Polyester

Zulfiqar Ali[1], Bilal Qadir[1], Ahsan Nazir[1], Zubair Khaliq[1], and Abdul Jabbar[1] and Ali Afzal[1,*]

[1] Faculty of Engineering and Technology, National Textile University Faisalabad, Pakistan

drzulfiqarali70@gmail.com

Abstract

The aim of this study is to develop the NIR camouflage fabric using the carbon black polyester fiber. Different blend ratio of cotton, polyester and carbon black polyester were used to prepare four yarns samples. These yarns were used to manufacture fabric samples having construction of 20*20/116*60 on a sample loom. After de-sizing, scouring and bleaching, camouflage design was printed on rotary printing machine by using vat dyes. Different tests were conducted on camouflage fabric samples to investigate the NIR reflectance, mechanical properties and comfort properties of camouflage fabric as per standard test methods. Analysis of mechanical testing data shows that there is no major effect on both tear and tensile strength due to addition of carbon black polyester fiber. Similarly, comparison of air permeability and overall moisture management data shows that there is also no major effect due to addition of carbon black polyester. Analysis of NIR data shows that reflectance of each colour reduces with increase in carbon black polyester blend ratio. Reflectance of samples having 3 % and above blend ratio of carbon black polyester at 1000

* Corresponding Author: aliafzalch89@gmail.com

nm is less than 40% which is maximum reflectance of all the natural objects in the surrounding of the forces field. Thus it can be concluded that camouflage in NIR region may be achieved by using carbon black polyester without any degradation of mechanical and comfort parameters.

Keywords: camouflage, NIR, reflectance, carbon black, polyester, cotton

Development of Spinneret Design for Composite Filament Fabrication: Part B

Ali Afzal[1], Zulfiqar Ali[1], Bilal Qadir[1], Amir Shahzad[1], Abdul Jabbar[1], and Ahsan Nazir[1,*]

[1] Faculty of Engineering and Technology, National Textile University Faisalabad, Pakistan

aliafzalch89@gmail.com

Abstract

Composite filament manufacturing is an area of interest for researchers working in smart and intelligent textiles. A very thin filament with good electrical conductivity and evenness is required for development of sensors and actuators. The problem being faced during manufacturing of these filaments is usage of metal core at central axial position of filament. In literature, few spinnerets were proposed which can fabricate such composite filaments, still their manufacturing process was complex. In order to develop composite filaments with core sheath structure, a set of spinnerets has been designed. The developed design is a modified design from previously designed extrusion die for composite filament fabrication. In this design, the core filament was guided through a tubal passage up to the exit of spinneret. The tubal passage was supported on a trilobal structure fitted in the hollow cylindrical design of outer spinneret part. The free space generated between the trilobal structure and inner cylindrical surface is for the passage of molten polymer up to the exit of spinneret. The lower end of spinneret was modified by giving a sharp edge by reducing the

* Corresponding Author : ahsan.nazirr@gmail.com

tapered surface of inner cylindrical shape up to the edge of lower spinneret side. This modification reduces the land length of the spinneret and force the melt polymer across the diameter towards in centre line of the filament. The core filament emerges out from the tubal passage few distance before the spinneret lower end, which ultimately provide good adhesion between core and sheath layers. The spinneret designs at different projection angles are provided below.

Dyeing of Wool Fabric with Natural Dye Extracted from Leaves and Stem Bark of Dalbergia Sisso

Muhammad Jawad Ul Rehman[1], Muhammad Tahir Hussain[1,*],, Munir Ashraf[1], Asfand Yar Khan[1] and Abdur Rehman[1]

[1] Functional Textile Research group, National Textile University, Faisalabad, Pakistan

Abstract

Due to growing environmental concerns, the usage of natural dyes for coloration of textiles is gaining special attention nowadays. The present study deals with dyeing of wool Fabric with natural dye extracted from Dalbergia Sisso. The as-extracted dye, when applied on wool fabric using potash alum, ferrous sulfate and zinc sulfate as mordants, showed reasonably good tinctorial strength on fabric. The shade hue and strength depended upon the type of mordant used. The color strength of dyed fabric was determined by K/S values and the effect of mordants on color tone, dullness and brightness was studied by measuring CIE Lab values. Colorfastness performance to light, crocking and washing of dyed fabric samples were measured in accordance with, ISO 105-B02: 1994, AATCC Test Method 8-2007 and ISO 105 C06 respectively.

* Corresponding Author: mtahirhussain@gmail.com

Effect of Crimp in Fabrics used for Carbon-Epoxy Composites

Rizwan Hussain[1]

[1] Laboratory for Advanced Materials & Processing (LAMP), Islamabad, PAKISTAN

rizhssn@yahoo.com

Abstract

Crimp in fabric is defined as wavy path introduced in fabric when warp and weft yarns interlace. Crimp affects abrasion resistance, shrinkage and mechanical properties. T300 carbon plain weave and Uni-directional fabrics were used as reinforcements with epoxy resin to prepare composite samples according to ASTM D-3039. Coupons were subjected to mechanical testing. UD fabric samples showed higher values of UTS (1454.8MPa), E (7.42%), Elasticity modulus (48.2GPa) and Average break load (75.02KN). In comparison plain weave coupons had UTS (625.83MPa), E (4.675%), Elasticity modulus (27.71GPa) and Average break load (32.44KN). These composite laminates were converted to sandwich samples using 3.2mm cell size Nomex honey comb. The 3-point bending plus Compressive load results obtained were (UD/PW) 3.07/2.36 and 4.56/3.83 respectively. This behavior of decreased mechanical performance of plain weave fabric as compared to UD is due to presence of overlaps in the weaved fabric composites.

The future work is envisaged with composites having non-woven and stretched tows fabrics. This is expected to produce improved mechanical performance of these types of composites with applications for airframes.

Effect of Extensibility on Compression Pressure and Thermal Properties of Compression Socks

Hafiz Faisal Siddique[1], Zdeněk Kůs[1], Adnan Ahmed Mazari[1]

[1] Technical University of Liberec, Czech Republic

hafiz.faisal.siddique@tul.cz

Abstract

The aim of this research was to analyze effect of leg sizes on compression pressure at ankle and calf portions and its mutual graduation (%). It was also studied the effect of transverse elastic elongation (%) on thermal effusivity (W.sec 0.5/(m^2 .K)) and thermal conductivity (W/(m.K)) in relaxed (0% extension) and extended state (70% extension) of compression socks. For this only three socks samples; BIISJ (Beige, compression level II, single jersey), BIIISJ (Beige, compression level III, single jersey), DGIIRIB (dark grey, compression level II, RIB) were purchased.

To extend the compression socks, a novel extension frame was used. To analyze lateral compression and mutual graduation (%) of compression socks, Kikuhime pressure measuring device was selected being more efficient device. C-Therm, TCi tester was used to evaluate thermo-physiological properties of compression socks in relaxed and extended state.

All the results were analyzed statistically using MINITAB 17 software to evaluate the significance (p value < 0.05) of results. Consequently, we found that as the elastic elongation in transverse direction of compression socks increases, a significant change in lateral compression and thermo-physiological properties i.e. thermal conductivity (W/(m.K)), thermal effusivity (W.sec

0.5⁄(m^2 .K)) takes place. Out the three socks samples; the best socks sample was rib structured compression socks sample that was DGIIRIB.

ABOUT CRESCENT TEXTILE

Crescent Textile has been contributing to Pakistan's economy since 1950. The company is successfully dealing with medium to large scale customers worldwide.

We at Crestex have a passion of relentless pursuit for innovation and quality which keeps us ready for tomorrow, Today our approach of "Raising the Bar" is key to our growth and sustainability.Our popular infrastructure and services backed by our innovative solutions deliver enhanced results for our customers.

WHAT WE DO?

We are dealing in yarn, processed fabric, retail, hospitality and health care segments. New focus groups are design lifestyle, performance textile & environment friendly products.

WHY CHOOSE US?

Innovation is the key component of our value structure. At present, the identity and purpose is based on excellence in research and quality of product development.

Our focus on R&D differentiates us from other industries and encourages collaborations to develop across the world.

www.crescenttextile.com
+92-41-111-105-105
crestex@ctm.com.pk

Export Competitiveness of Pakistan's Textile Goods to European Union (EU): Constraints and Opportunities

Javaria Tabassam[1], Asghar Ali[1], Muhammad Usman[2], Sajjad Ahmad Baig[2], Muhammad Hashim[2] and Muhammad Zia-Ur- Rehman[2]

[1] Institute of Agricultural and Resource Economics, University of Agriculture Faisalabad-Pakistan.

[2] Department of Management Sciences, National Textile University, Faisalabad-Pakistan.

asghar.ali@uaf.edu.pk

Abstract

Textile industry is the backbone of Pakistan's economy by contributing 8.5 percent share in GDP. Pakistan stands as fourth largest cotton producer, having third largest spinning size in Asia. Pakistan is the 8th largest textile exporter and has a significant role in terms of generating employment opportunities and earning foreign exchange. Although Pakistan attracts attention of importers of textile goods due to its specialty in cotton, yet it has to face a strong competition in the world market. The main objective of the study was to analyze the determinants of textile exports to European Union countries and review the GSP plus trade policy of EU and its effect on Pakistan's export industry. The study used both primary data from 50 exporters of Faisalabad region and time series data from 1975-2015. The effectiveness of textile exports of Pakistan to European Union 28-member countries was checked and estimated through different economic indicators as Gross Domestic Production, Human Development Index (proxy "life expectancy"), Trade openess (proxy "trade ratio"), infrastructure (proxy "length of roads"), electricity

consumption percentage use in textile sector and exchange rate. Auto Regressive Distributed Lag Model was applied to check co-integration level between dependent and independent varaibles.The overall results showed that model is significant, indicating that combined effect of all independent variables was statistically significant. F-Statistics value explained co-integration amongst all variables, showing long-run relationship among textile export to European Union countries and explanatory variables. The GSP Plus status has allowed almost 20 per cent of Pakistani exports to enter the EU market at zero tariffs and 70 percent at preferential rates. This status had enabled Pakistan to export more than US $1 billion worth of products to the international markets. The study suggested providing an enabling environment in the country to enhance exports.

Keywords: Textile, Export Competitiveness, European Union, GSP plus, Auto Regressive Distributed Lag Model, Co-integration, Pakistan

Fabrication of Flexible and Conductive Cotton Fabric Electrode

Iftikhar Ali Sahito[1,2], Kyung Chul Sun[3], Alvira Ayoub Arbab[1,2], Muhammad Bilal Qadir[1], Naveed Mengal[1,2], Anam Ali Memon[1,2], Yun Seon Choi[1] and Sung Hoon Jeong[1]

[1] Department of Textile Engineering, Mehran University of Engineering and Technology, Jamshoro, 76060, (Pakistan)

[2] Department of Organic and Nano Engineering, Hanyang University, Seoul 133-791, (Republic of Korea)

[3] Department of Fuel Cells and Hydrogen Technology, Hanyang University, Seoul 133-791, (Republic of Korea)

iftikhar.sahito@faculty.muet.edu.pk

Abstract

We present fabrication method for the production of flexible and conductive cotton fabric electrode for its application in various energy applications. The graphene oxide (GO) was synthesized using the modified Hummers method having graphite flakes as starting material. A plain weave standard cotton fabric is dip coated in the stable suspension of GO nanosheets and dried, the process was repeated many time to increase the amount of coated GO nanosheets on the cotton fabric. The coated GO was reduced using hydrazine hydrate to convert GO into reduced GO (rGO). A very low surface resistance of only 7 ohms/square was achieved by this way. The prepared flexible and conductive cotton fabric can be used in as electrode material for various energy applications.

Keywords: fabric, graphene, electro conductivity, energy applications

Filtration and Comfort Properties of Face Masks Containing Polyamide Electro-spun Nanowebs

Ahsan Nazir[1], Muhammad Bilal Qadir[1], Zulfiqar Ali Malik[1], Abdul Jabbar[1], Affan Abid[1], Amir Shahzad[1], Zubair Khaliq[1], Muhammad Ali Afzal[1,*]

[1] Faculty of Engineering & Technology, National Textile University, Faisalabad, Pakistan

ahsan.nazirr@gmail.com

Abstract

Protection for respiratory system has become a need of the day due to increased air pollution. Different nonwoven filter media have been utilized for this purpose. However, performance of such systems may be improved further by addition of finer fibrous materials such as electrospun webs. Moreover, the comfort properties of such media also need to be studied as they can affect the performance of wearer. In this study, electrospun nanowebs were incorporated between layers of commercially available nonwoven filter media to improve its performance. The effect of addition of nanofiberous web between layer of nonwoven filter media on comfort properties was also studied. It was concluded that inclusion of nanowebs, significantly improved the filtration capability of filter media. Moreover, it was found to have mixed impact on comfort properties of the resultant composite filter media.

Keywords: filtration, comfort, face mask, electrospinning, performance

* Corresponding Author: aliafzalch89@gmail.com

Functional Finishing of Textiles for Technical Applications

Awais Khatri [1]

[1] Department of Textile Engineering, Mehran University of Engineering and Technology, Jamshoro

awais.khatri@faculty.muet.edu.pk

Abstract

Textile finishing has always had a decision-making role in terms of end use and the ultimate consumer satisfaction. It has gained even more importance during last few decades because of its expanding role in technical applications of textiles. The applications include stain proofing and self-cleaning, rain proofing, extreme comfort, antibacterial/antimicrobial activity, mosquito repellency, durable functions and many more. Such technical characteristics are achieved through functional finishing of textiles. This keynote talk is focused at those functional finishing processes which are categorized into three ways, i.e. emerging chemistries with conventional processing technologies, nanotechnology and other emerging technologies such as plasma, laser, ultra-sonics etc.

Functional Polymers for Applications in the Technical Textile Industry

Nasir M. Ahmad[1]

[1] School of Chemical and Materials Engineering (SCME), National University of Sciences and Technology (NUST), H-12 Sector, Islamabad-44000, Pakistan

nasir.ahmad@scme.nust.edu.pk

Abstract

Synergistic efforts in materials science, polymer chemistry and biotechnology have increasingly lead to new polymer based textile materials with innovative functionalities such as smart, antifouling, self-cleaning, etc. These new materials are increasingly being used in a wide range of industrial application including building construction, medical applications, civil engineering, automotive, water technology, transportation, etc. Technical and functional textiles can be used in the form of fibers, yarns and /or textiles or incorporated in a composite (fiber reinforced materials). The end applications area is truly multidisciplinary and will be highlighted.

Functionalization of Cotton Fabric Imparting Mosquito Repellency, UV Protection and Antimicrobial Potential Using Seven Selected Plants

Munazza Maqbool[1], Shaukat Ali[1], Muhammad Tahir Hussain[2], Muhammad Atif[1], Sadia Noureen[1], Shahid Adeel[3]

[1] Department of Chemistry, University of Agriculture, Faisalabad, Pakistan.

[2] Department of Applied Sciences, National Textile University, Faisalabad, Pakistan

[3] Department of Chemistry, Government College University, Faisalabad, Pakistan

mtahirhussain@gmail.com

Abstract

In wake of eco-friendly approach, there is a growing trend to impart various functional attributes in textile substrates through Green Chemistry approaches. In this context, a comparative study of coloration, mosquito repellency, UV protection and antimicrobial potential was conducted using seven selected plants. The plant biomass includes leaves of Lawsonia inermis, rhizome of Curcuma longa, bark of Acacia nilotica & Eucalyptus globules, peels of Punica grantum & Allium cepa and flowers of Tagetes erecta. For this purpose, extracts of these plant biomasses were applied on cotton fabric samples and their color strength by Kubelka-Munk equation; anti-microbial potential by zone of inhibition in bacteriostasis agar; UPF for UV protection by ultraviolet absorbance analysis; mosquito repellency by percentage insect landing and percentage repellency were evaluated. It was found that Tagetes erecta showed good mosquito repellency, UV protection and

antimicrobial potential along with its exceptionally high color strength value but poor fastness properties. However, Acacia nilotica demonstrated outstanding fastness properties and other studied attributes but showed moderate color strength value.

Keywords: mosquito repellency, zone of inhibition, UPF (ultraviolet protection factor)

Investigating the impact of GSP plus Status: Intellectual capital and firm Performance in Textile Industry of Pakistan

Fiza Amjad[1,*], Muhammad Zia Ur Rehman[1], Sajjad Ahmad Baig[1], Muhammad Usman[1], and Muhammad Hashim[1]

[1] Department of Management Sciences, National Textile University, Faisalabad, Pakistan.

m.zia.says@gmail.com

Abstract

Importance of Intellectual capital grabs the intension of researchers. Intellectual capital is considered as a critical success factor for enterprises in today's dynamic business environment. Previous studies indicate that the Intellectual capital is significant contributing factor to the organizational performance in developed countries. The purpose of study is to examine three elements i.e. structural capital, customer capital and human capital and its impact on firm performance through the moderating role of GSP plus status. The purposed model was tested with the help of statistical software SPSS 23 and AMOS. The sample size was about 450 respondents. The findings show that intellectual capital have a significantly impact on firm performance. Additionally, the GSP plus moderates the relationship between intellectual capital and firm performance. The findings of this study will guide the textile exporters to understand how to enhance the firm performance by efficient use of Intellectual capitals. The current study is among

* Corresponding Author: fiza.amjad1@hotmail.com

the pioneer to consider GSP plus as the moderator between intellectual capital and firm performance, which is relatively new concept. This study generates a link between international trade opportunities and firm performance. The Government, as well as textile industrialist, have to invest in capacity building of their employees demand driven output to get maximum benefits from, this GSP+ status.

Keywords: GSP plus, human capital, structural capital, customer capital, performance

Investigation of Comfort Properties of Flame Resistant Fabrics

Uzair Hussain[1], Hafsa Jamshaid[1], and Waseem Ibrahim[1]

[1] Protective Textile Group, National Textile University, Pakistan

uzair@ntu.edu.pk

Abstract

Flame resistant (FR) are used to prevent fires from starting, limit the spread of fire and minimize fire damage. As consumers are more concern about safety parameters, so it is the need of time to develop FR apparels. Aim of the present study is to reduce price and improve comfort properties of fabric. This study involves the comprehensive analysis of comfort properties of fabric like air permeability, moisture management and FR property by vertical flammability test. Influence of blend ratios and count were also studied. Two different fibers FR Viscose and Protex-c were used in blend. Three different blend ratios of Protex-c and FR viscose (70/30 %, 50/50 %, 30/70 %) were used to make ring spun yarn. Finer and coarse yarn was produced from each blend ratio.

Keywords: comfort, fire resistant, blend ratio, protective textiles

Investigation of the Ballistic Properties of Hybrid Aramid Fabrics

Mehmet Karahan[1], Abdul Jabbar[2] and Nevin Karahan[1]

[1] 1University of Uludag Technical Sciences of Vocational School, Gorukle Bursa TURKEY

[2] Faculty of Engineering and Technology National Textile University 37610 Faisalabad

mkarahan@uludag.edu.tr

Abstract

Ballistic protection is important especially in personnel protective applications. When we see through the point of view of end user, ballistic performance is represented as performance to weight ratio of structure. This requires the minimum trauma depth obtained with an acceptable weight. Woven and unidirectional nonwoven fabrics have their own advantages and disadvantages. Unidirectional nonwoven structures are lighter, more flexible and have better energy spreading capability than woven fabrics. But, the strength of these fabrics against fragment effect is not as good as that of woven fabrics. Rigidity and weight disadvantage of woven fabrics can be eased to some extent by using them at certain ratios together with unidirectional nonwoven fabrics in hybrid panels. This paper presents an investigation regarding the ballistic performance of hybrid panels formed by combining woven and unidirectional para-aramid fabrics. For this purpose, hybrid panels are formed by combination of Twaron CT 710 type woven and K-Flex unidirectional para-aramid fabrics with different ply ratios. The hybrid panels formed in this way are subjected to ballistic tests according to NIJ standard. Ballistic performance of test samples are determined by measuring trauma depth and trauma diameter. The energy absorbed by fabric panels and the energy transmitted to the back of fabric panels are determined from trauma depth and diameter values

using a different approach. The results show that hybrid panels present 4.48% less trauma depth as compared to 100% Twaron woven fabric panels and 3% less trauma diameter as compared to 100% unidirectional fabric panels. Furthermore, 13.9% less energy is transmitted to the back side of hybrid panels as compared to 100% unidirectional fabric panels. The energy absorbed per unit weight in hybrid panels is 8.48% more as compared to 100% Twaron woven fabrics. Additionally, in wet conditions, less trauma depth of hybrid panels is observed as compared to both 100% Twaron woven and 100% unidirectional K-Flex fabric panels. No significant difference is realized in trauma diameter between hybrid panels and 100% Twaron woven fabric panels in wet conditions. However, 3.25% less trauma diameter is noted in hybrid panels as compared to 100% unidirectional K-Flex fabric panels.

Keywords: ballistic performance, hybrid structure, energy absorption

Isocoumarins: Compounds with Unique Applications

Muhammad Tahir Hussain[1], Munir Ashraf[1], and Abdur Rehman[1]

[1] Functional Textiles Research Group, National Textile University, Faisalabad, Pakistan

mtahirhussain@gmail.com

Abstract

Isocoumarins are benzo derivatives of pyranone (2H-pyran-2-one), a six-membered oxygen heterocyclic compound. These isocoumarins and 3,4-dihydroisocoumarins are secondary metabolites found naturally in a wide variety of fungi, lichens, molds, insects and plants. This class of aromatic lactones has a wide range of industrial and pharmacological applications such as pharmaceutical, food, agriculture, cosmetics, nutraceutical, UV absorbers, fluorescent agents, sweeteners, healthcare products, antibacterial and antifungal agents etc. Isocoumarins and 3,4-dihydroisocoumarins are very stable compounds and the structure of these molecules can be modified according to the required properties. These molecules can be used for imparting different functional properties to textiles like UV absorbance, fluorescence, antifungal, antibacterial etc. This class of compounds can be effectively explored for new functional materials to be used in the field of textile.

Jute Fibers Reinforced Thermally Activated Polymer Composite Actuators

Abdul Basit[1], Jasim Zia[1], Yasir Nawab[1]

[1] Textile Composite Materials Research Group, Faculty of Engineering and Technology, National Textile University, Faisalabad, Pakistan

basit_ntu@yahoo.com

Abstract

Thermally activated actuators are important smart materials. These actuators are activated through a heat source. In this work, Jute yarns were used to develop thermally activated actuators. Different actuators were developed by putting one longitudinal layer of Jute yarns while varying the no. of transversal layers. Epoxy resin with a Tg of 65 °C was used as a matrix. The actuators were deformed by using heat provided with an internal source of heating within the composite. Carbon yarns were used as an internal heating source: being connected to a power supply providing heat by the Joule effect. The actuation and the stress produced by the actuators have been characterized. Actuation is characterized by allowing them to freely actuate and stress is characterized by fixing the actuators and measuring the stress produced while activated. It is found that the maximum actuation is achieved by the actuator with two transversal layers. It is further found that stress increases on increasing the no. of transversal layers and maximum stress is achieved by the actuator with maximum no. of layers i.e. 8 transversal layers.

Keywords: jute fibers, polymer composite, actuators, free actuation, stress actuation

Light Side Emitting Textile Linear Composites

Jiří Militký[1], Dana Křemenáková[1], and Rajesh Mishra[1]

[1] Textile Faculty, Dept. of Material Engineering, Studentská 2, Liberec 461 17 Czech Republic

jiri.militky@tul.cz

Abstract

Standard polymer optical fibre (POF) is a dielectric waveguide transferring light or infrared radiation across its axis by the mechanism of total internal reflection on the interface of two materials with different refractive indices. In the side emitting plastic optical fibres (SEPOF) the light leaks out from their surface. Side emission occurs if the light incidence angle is smaller than critical angle. This effect can be obtained by the increasing of cladding refractive index, decreasing of core refractive index or by the change of incident light angle. It is also possible to use multiple micro-bending of core or cladding; additives causing reflection or fluorescence into core/cladding or to create geometric asymmetry in the core/cladding system. There are various commercial types of patented SEPOF including methods of their preparation. The SEPOF can be used for creation of optically active textile structures providing opportunities to highlight people and objects without the need for external light exposure. Due to the transmission loss, the intensity of radiation emitted in any direction decays exponentially along the straight fibre axis with increasing distance from the light source.

An optical fibre integrated in weaving patterns can be described by a sequence of locally bended and straight sections. For this case the transmission loss is based on the distance between threads, thickness of threads and weaves. Local bends should be suppressed in the cases of using SEPOF

for achieving active visibility at higher distances from light source. It is therefore necessary to use special embedding of SEPOF into textile structures e.g. in the form of tubes wrapped by textile yarns.

The main aim of this contribution is description of SEPOF optical properties and their efficient embedding into fibrous structures for creation of safety textile structures with active visibility in shadows. For preparation of textile structures containing SEPOF the braiding technology is used. The SEPOF end connected with light energy source is prepared by cutting with heated wire and then by polishing with diamond powder. Illumination system with light emitting diode (LED) is used as light source (illumination intensity of source is 43.9 Wm-2). The special device for measurement of light intensity on surface and cross section at various distances from light source is described. Light intensity of textile structures is compared with light intensity of fibers.

Mechanical Behavior of Nanocellulose Coated Jute/Green Epoxy Composites

Abdul Jabbar[1], Ali Afzal[1], Zulfiqar Ali Malik[1], Muhammad Bilal Qadir[1], Ahsan Nazir[1] and Hafiz Affan Abid[1,*]

[1] Faculty of Engineering & Technology, National Textile University, Faisalabad, Pakistan

abduljabbarntu@gmail.com

Abstract

Natural fiber reinforced polymer composites (NFPC) have gained considerable attention in the recent years due to their environmental and economic benefits and low energy consumption. Natural fibers offer many advantages over their synthetic counterparts (e.g. glass and carbon) such as cost effectiveness, easy to process, renewable, recyclable, and available in huge quantities and low fossil-fuel energy requirements. Thus, natural fibers are considered promising candidates for replacing conventional synthetic reinforcing fibers in composites for semi-structural and structural applications.

Cellulose is an abundant, renewable and biodegradable naturally occurring material on earth that can be obtained from numerous resources. It is an infinite source of raw material for environment friendly and biocompatible products. Lignocellulosic fibers such as jute, hemp and flax etc. are rich in cellulose, abundantly available and easy to handle and process. Cellulose micro/nano fillers

* Corresponding Author: affanabid2001@gmail.com

in polymers have already attracted considerable interest by improving the strength and stiffness of resulting composites. Various types of cellulosic resources are used as precursors to extract and purify cellulose fibrils from lignocellulosic fibers. Cellulose micro/nano fibrils obtained from different precursors such as hemp fibers, pineapple, isora and jute fibers etc. are used as reinforcing filler in polymer matrices and resulted in the improvement of composite properties. However, in the present study, waste jute fibers were used as precursor to extract and purify nanocellulose which was subsequently coated over the woven jute fabric instead of using it as filler in matrix. . Cellulose was purified from waste jute fibers, converted to nanocellulose by acid hydrolysis and subsequently 3, 5 and 10 wt % of nanocellulose suspensions were coated over woven jute reinforcement. The composites were prepared by hand layup and compression molding technique. The surface topologies of treated jute fibers, jute cellulose nanofibrils (CNF), nanocellulose coated jute fabrics and fractured surfaces of composites were characterized by scanning electron microscopy (SEM). The prepared composites were evaluated for tensile, flexural, fatigue and fracture toughness properties.

The results revealed the improvement in tensile modulus, flexural strength, flexural modulus, fatigue life and fracture toughness of composites with the increase in concentration of nanocellulose coating over jute reinforcement except the decrease in tensile strength. Based on the analysis of results, the improvement in mechanical properties were likely attributed to the increase in interfacial interaction between reinforcement and matrix due to large surface area exposed by nanocellulose coated over jute reinforcement, the formation of rigid and stiff network interconnected by hydrogen bonds and the increase in the stiffness of reinforcement with increasing nanocellulose concentration. Whereas, the differences in failure strains of coated jute

reinforcement and the matrix might be the reason of reduction in tensile strength of these composites.

Normal Needleless Electrospinning and Induced Needleless Electrospinning

Usman Ali[1], Haitao Niub[2], Tong Linb[2]

[1] College of Textile Engineering, BZU, Multan 60800, Pakistan

[2] Institute for Frontier Materials, Deakin University, Geelong, VIC, 3216, Australia

usman.ali@bzu.edu.pk

Abstract

Nowadays needleless electrospinning is a well-known technique to produce polymeric nanofibers on large scale. This study was conducted to see the influence of spinneret polarity on needleless electrospinning. Depending on the type of spinneret polarity, electrospinning led to different fiber morphology, productivity and areal density. The electric field profile in the electrospinning zone was analyzed by using finite element method. It was revealed that the intensity of electric field was higher in the part that was connected with a high voltage electrode. This could be the main reason of variances in fiber diameter, productivity and areal density.

Keywords: spinneret, electrode polarity, sprocket wheel, electric field

Online Structural Health Monitoring of Composite Structures using Smart Sensors

Dr. Muhammad Ali Nasir[1]

[1] Department of Mechanical Engineering, University of Engineering and Technology, Taxila

ali.nasir@uettaxila.edu.pk

Abstract

Now a days advanced composites having superior physical and mechanical properties are being developed, new means and methods for making them intelligent are eagerly being sought. Modern visions of next generation aerospace vehicles comprise the use of distributed sensors and actuators, which are incorporated into the composite laminate structures on nano level. The eventual goal is to reduce cost, weight, and design complexity while high performance polymers are being considered for use in this endeavor due to their light weight, high thermal and chemical stability and mechanical durability.

This research talk is based on a novel thermoplastic based conductive polymeric blend of Polystyrene/Carbon black (PS/CB) coating for strain sensing in online structural health monitoring system. It has been demonstrated that interfacial bonding between the carbon nanoparticles is greatly improved by the Polystyrene polymer. The strain sensing behaviour of piezoresistive PS/CB blend coated on aerospace grade glass fabric is also investigated. The PS/CB was first blended to produce electrically conductive piezoresistive coating. The coating was then applied on glass fabric using doctor blade technique. This coated fabric was analyzed for two types of configurations i.e. PS/CB coated glass fabric and PS/CB coated glass fabric impregnated with

epoxy polymer. The two types of specimens were tested at different strain rates and ply orientations. The PS/CB coated fabric showed improved response for relatively slower and intermediate strain rates between 10-4 s-1 and 10-3 s-1. The PS/CB coated fabric infused with epoxy configuration showed promising results for strain rate of about 10-3 s-1. However, the PS/CB coated fabric impregnated with epoxy was ineffective at higher strain rates. The morphology of both types of coatings was obtained using SEM to properly characterize the PS/CB blend as a potential strain sensor.

This PS/CB strain sensor is a piezoresistive type electrical strain sensor and it can be used with wheatstone circuitry like a conventional strain gauge. Piezoresistive effect of the sensors is investigated. When strain is produced, they undergo variation in their electrical properties i.e. electrical resistance. Graphical relationship is developed between voltage variations and strain. Gauge factor of the sensors is also calculated. This lecture will demonstrate also the strain measuring ability of smart sensing layer for notched composite specimens. The real life stresses in smart skins of future aerospace structures have been investigated under different notch spacing. To find out the condition of strain at the sensing layer, Finite element based numerical simulations of the stress/ strain concentration have been carried out in the presence of different defect configurations by using ABAQUS. This has been experiential that smart sensing layer detects accurately the existence of large deformations and damage due to defects in the structure with evidently distinct peaks at the points of structural damage. Dynamic response of smart PS/CB coating describes the possible use of this smart paint sensor for monitoring structural vibrations, mechanical excitation and cyclic loads. The PS/CB coating sensor showed remarkable repeatability when multicyclic loadings were applied. The intelligent coating effectively responded to the applied strain under dynamic conditions. The cyclic response of the smart coating showed

that the sensors are competent of following loading and unloading cycles of specimens without any delay.

This experiment determined the efficiency and the structural integrity of intelligent coating used for composite specimens under dynamic loadings. The capacitance effect of coated strain sensor was considered and found to have a minimal effect on the dynamic response. This sensor is able to detect small crack propagation under dynamic loading. The coating remained intact within a safe strain limit and showed no physical damage after 20 cycles. The change in resistivity has been correlated with the change in strain.

Potential of Nonwoven Textiles for Pakistan's Industry

Zulfiqar Ali[1], Bilal Qadir[1], Amir Shahzad[1], Hafiz Affan Abid[1] and Ali Afzal[1,*]

[1] Faculty of Engineering and Technology, National Textile University Faisalabad, Pakistan

drzulfiqarali70@gmail.com

Abstract

Nonwovens are the innovative fabrics, produced directly from fibres. These are manufactured for a variety of applications such as Apparel, Automotive/Transportation, Consumer Products, Electronics, Filtration, Furnishings/Bedding, Geotextiles/Construction, Hygiene, Medical/Healthcare, Packaging and Wipes. The global nonwovens fabric market was valued at about $40 billion in 2016 and according to recent studies, it is anticipated to grow up to about $50 billion by 2020 at a growth rate of about 6-7 per cent. Globally, Asia is the major consumer of nonwovens in the world. In 2016, this was manifest in a market share of 43.7 per cent for Asia, with consumption of 3.87 million tonnes. Asia will keep on growing with an estimated global market share of 47 per cent and volume of 5.6 million tonnes in 2020. Pakistan is far away in this market as compared to Asian players such as China, India and Japan. Industrialists, Technologists and Government of Pakistan has to think about this market and related technologies. It's an excellent time to be involved in nonwoven product manufacturing. Like never before, innovation and investment are critical as the market continues to expand. The future is brilliant for the nonwovens.

* Corresponding Author: aliafzalch89@gmail.com

Keywords: nonwoven, innovative, technology, manufacturing, market growth and Pakistan

Preparation of Anti-Microbial Finishes by Eco-Friendly Method from Peel of Citrus Fruit (Lemon) and Analyse Anti-Microbial Activity on Cotton Fabric

Syed Qutaba[1*], Awais Yasin[1], M.A. Zeeshan[1] and Rehan Abbasi[1]

[1] Department of Textile Engineering, Faculty of Engineering, BUITEMS, Airport road Quetta, Pakistan.

yasinawais53@gmail.com

Abstract

Cotton fabrics with antibacterial assets have become essential to organize and manage the infestation by microbes, and to reduce the formation of odor. The fabrics with antimicrobial finishes are highly hygienic in all dimensions particular, when consumed by human beings. In order to evaluate antimicrobial activity, we have prepared natural and Eco-friendly organic extracts from peels of citrus fruit like lemon. The fabric samples were tested for antimicrobial activity against bacterial strains like Staphylococcus, E.coli, Bacillus, and C.albicans under qualitative and quantitative analysis.

The results indicated that the cotton fabric show a better microbial resistance against the above-mentioned strains. As per qualitative analysis, the fabric treated with extract showed best reduction against Staphylococcus by analyzing antimicrobial activity. The results were improved by binding

* Corresponding author: engrsyedqutaba@gmail.com

agent for repeated textile washing and compare the result of two binding agent bicarbonate and acetic Acid which helps to improve the antimicrobial finish bind with fabric also prevent to remove after washes.

Keywords: textile fabrics, natural extract, eco-friendly, fruit peel (lemon) antimicrobial activity, staphylococcus aureus, escherichia coli, c.albicans, bacillus, binding agent

Process of Functional Hybrid Spun Yarns Containing Metallic Fibers for EMI Shielding Fabrics

Amir Shahzad[1], Zulfiqar Ali Malik[1], Muhammad Bilal Qadir[1,*], Abher Rasheed[1], and Ahsan Nazir[1]

[1] Faculty of Engineering & Technology, National Textile University, Faisalabad, Pakistan

amir_textilian@hotmail.com

Abstract

Technical yarns have become a focal point of research due to their potential applications in various types of technical textiles. Among these technical yarns, the electro-conductive yarns are getting importance for ESD, EMI shielding, smart textiles, interactive textiles, stealth technology in military and medical textile applications. In this research the production process of conductive hybrid spun yarn made of stainless steel, polyester (PS) and stainless steel, viscose (VS) blends was studied. In process of spinning fibres into spun yarn, the setting of process parameters varies greatly owing to the properties of fibres. The steel fibre has higher specific gravity, linear density, coefficient of friction and lower elongation and flexibility characteristics compared to the blend component polyester and viscose fibres. Hence for smooth running of steel fibre blended materials, the position of sliver cans in creel, draft distribution, draft zone clearance, rotational speeds of roller and twist factor are found to be the key parameters. The linear electrical resistance (LER) of

* Corresponding Author: bilal_ntu81@hotmail.com

PS and VS hybrid yarns were studied using two probe method under a constant pretension of 0.5 cN/tex. The single yarn tensile properties were measured on Uster Tensorapid based on constant rate of extension (CRE) principle. The electromechanical properties were evaluated with respect to the effect of twist factor, yarn linear density, plying and twisting, blend type and relative humidity. The combination of polyester and stainless steel fibre was found superior in electro-mechanical properties. It was found that the linear electrical resistance had a direct relationship with linear density. Yarn produced by plying and twisting was found to have larger LER values than that of single yarn with same linear density. Regarding twist factor, it was observed as a significant factor to lower the LER at given blend ratio of both types of yarns while the relative humidity was noted to have similar effect on LER values where steel fibres was blended with hygroscopic fibres.

Keywords: hybrid yarns, metallic fibre, electro-conductive, electrical resistance, stainless steel, humidity, plying and twisting

itema

Weaving Technical? Do It ITEMA!

Discover more by contacting
Faizan.Ahmed@itemagroup.com
or Namra.Babar@noon.com.pk

itema campus

NOON GROUP OF COMPANIES

Noon International (Pvt.) Ltd.
10th KM Raiwind Road
Near Lahore Park Stop
53706 Lahore

3 technologies, 1 brand

Rapier

Airjet

Projectile

www.itemagroup.com
contact@itemagroup.com

Processing and Development of Multifunctional Yarns and Fabrics for Interactive Gloves

Muhammad Bilal Qadir[1], Amir Shahzad[1,*]*, Abher Rasheed[1], Ali Afzal[1], and Hafiz Affan Abid[1]

[1] Faculty of Engineering & Technology, National Textile University, Faisalabad, Pakistan

bilal_ntu81@hotmail.com

Abstract

The use of conductive materials in smart and interactive textiles is gaining significant importance for creating value addition, innovation and functional product development. These products find their potential applications in health monitoring, military, protection, communication, sensing, monitoring, actuation, fashion, and life styles. The materials which are most commonly employed in such type of interactive textile include intrinsically conducting polymers, conductive inks, and metallic coating on textile fabrics and inherently conducting metallic fibre yarns. In this study, silver coated polyester filament yarn is explored for the development of multifunctional interactive gloves. The composite yarn was developed by covering the silver coated polyester filament around the polyester spun yarn using hollow spindle technique. The electrical and tensile properties of the yarn were studied. This novel yarn was used to manufacture a smart glove to explore the antibacterial, functional, and interactive properties of the yarn. The change in electrical resistance due to finger movement at different bending positions and antimicrobial properties were studied.

* *Corresponding Author: amir_textilian@hotmail.com

This glove was also found useful as an interactive tool to operate the commonly used touch screen devices due to its conductive nature. The yarn can also be used to develop the sensing elements like stretch, strain, and piezoresistive sensors. Such sensor can be effectively used in medical and sport textile for performance monitoring, vital signs monitoring and development of antibacterial textile for health care and hygiene.

Keywords: conductive yarn, interactive textiles, peiezoresistive sensors, smart gloves, composite yarn

Production of PLA Integrated Chitosan Nanocomposites for Improved Functional Properties of Cotton Fabric

Faiza Anwar[1]

[1] School of Textile and Design, University of Management and Technology, Lahore

faiza.anwar@umt.edu.pk

Abstract

The aim of the study was to investigate the fabrication of novel poly (lactic acid) (PLA) and chitosan composite nanoparticles (NPs). The characterization of prepared composite NPs were done by using scanning electron microscopy, energy dispersing X-ray, FTIR spectroscopy and zeta size analysis. The composite NPs were then impregnated on cotton fabric by employing the pad-dry-cure method. The treated cotton fabric was characterized for surface, functional and physical. The spectral and optical properties demonstrated that the composite NPs expressed spherical structural pattern with an average particle diameter of about 88.02 nm. An antibacterial activity of treated fabrics ranging from 75 to 90% depending on the concentration was observed. The physical properties were statistically verified for significant and insignificant factors.

Keywords: chitosan, nanocomposite, PLA (polylactic acid), textile

Recent Advances in Thermal Spray Technologies & Coatings

Muhammad Yasir[1]

[1] School of Material s Science & Engineering, Institute of Space Technology Islamabad.

muhammadyasir85@gmail.com

Abstract

Bulk metallic glasses (BMGs), also called amorphous alloys, have totally different structure from the conventional crystalline metals and are well-known for their high strength and high hardness, large elastic limits, and, in particular, for their outstanding corrosion and wear resistance. During the past several decades, despite the understanding gained on the formation and microstructure, as well as the mechanisms related to their unique mechanical properties that have achieved great progress, industrial applications of BMGs are still very scant due to mostly the poor ductility at room temperature. In contrast, amorphous coatings based on BMG systems have received increasing attention and interest in recent years because of the combination of the excellent properties inherited from the bulk glassy alloys and the potential engineering applications for amorphous coatings.

In this talk, we will briefly summarize the past development and the recent progress of thermal spray coatings in terms of fabrication, microstructure, thermal stability, and properties such as corrosion and wear resistance, bonding strength and wettability. In addition, we also describe simply the foreseen potential applications and future developments of this kind of materials for the textile industry.

Recent Developments and Potential Applications of Bacterial Polyesters

Zulfiqar Ali Raza[1] and Sharjeel Abid[1]

[1] Department of Applied Sciences, National Textile University, Faisalabad-37610, Pakistan

zaraza@ntu.edu.pk

Abstract

Polyhydroxyalkanoates (PHAs) are bio-polyesters, have prevalence within microbial cells as energy storage materials. Due to their biocompatibility and biodegradability, PHAs have wide applications in various industries such as biomedical science including meniscus repair devices, bone plates, tendon repairing, pericardial patches, bone marrow scaffolds, tissue engineering, wound dressings, in addition to use as biofuel, drug delivery carriers and biosensors. PHAs are green plastics and they have positive social and environmental impact when compared to conventional plastics in terms of production and recycling. The bioplastics represent a renewable and sustainable resource to reduce landfill space use without persistence or pollution. This study covers production and characteristics of PHAs, developments in their production, and potential applications in various industries including nanotechnology.

Keywords: polyhydroxyalkanoates; biopolyester; bioplastic; nanotechnology; polyester

Role of Nanoscience & Nanotechnology in Textile Industry

Irshad Hussain[1,2]

[1] Department of Chemistry, SBA School of Science & Engineering (SSE), Lahore University of Management Sciences (LUMS), DHA, Lahore Cantt-54792, Pakistan

[2] US-Pakistan Center for Advanced Studies in Energy (USPCAS-E), UET, Peshawar

ihussain@lums.edu.pk

Abstract

Metal/metal oxide nanoparticles have been recognized as an important class of nanomaterials whose properties can be tuned by controlling their size, shape and surface chemistry. Depending on their nature, size, shape and surface chemistry and thus the properties, metal/metal oxide nanoparticles are known to have potential applications in various fields including biomedical sciences, textile industry and energy technologies. In this regard, we have developed several reproducible protocols to prepare functionalized metal nanoparticles from subnanometer to over 100 nm in aqueous/organic media with a fair control over their size, shape, and surface chemistry. These metal nanoparticles have been used as building blocks to design/synthesize new nanostructured materials such as composite thin films, porous metal foams, inorganic oxide – metal nanoparticle hierarchically porous composites (heterogeneous catalysts), nanowires, porous microwires, porous nanoballs, nanochains, and nanoscale circuit patterns etc. using template-based and template-less strategies. The functionalized metal/metal oxide nanoparticles/nanoclusters possess interesting optical, recognition and catalytic/bio-catalytic properties and currently we are focusing on their applications in bio-sensing (especially bacterial detection), bio-imaging, drug

delivery, environmental remediation, textile industry and renewable energy technologies. For industrial applications, the large-scale production of these nanoparticles is essentially required. This talk would, therefore, be an overview of our interdisciplinary research activities to synthesize customized inorganic/organic nanoparticles having unique chemical and physical properties, their large-scale production and diverse applications especially in the textile industry.

Smart Textiles: An Elegant Approach to Hybrid Design Process

Syed Zameer Ul Hassan[1]

[1] Balochistan University of Information Technology, Engineering and Management Sciences, Quetta

syed.zameer@buitms.edu.pk

Abstract

Smart textiles are gaining center of attention for the researchers due to numerous applications in various fields like military and medical fields, for electromagnetic shielding and as sensors and actuators. Application areas of these sensors include human machine interface (HMI), healthcare, robotics, ageing population, sports and internet of things (IoT). Rapid development in HMI has motivated researchers to explore this area for different useful applications. This has urged to incorporate conductive yarns into wearable systems. However conductive fabrics can be obtained through different means like metallization, chemical coating, and deposition of thin layers of conductive fillers like carbon black particles or through the insertion of metallic yarns.

In this work a smart glove has been developed using textile strain sensors which are stitched above each finger. Glove was manufactured by stitching plain knitted stretch sensors utilizing the conductive yarn that has polyester blended with steel and lycra. The analog data from these sensors was collected using an Arduino board. These values were mapped to provide binary logic which can further be used in different applications. The bend and strain sensing properties of these sensors were used to read different hand gestures through an Arduino controller board. After processing, the glove was found capable to recognize gesture and able to function as an HMI device that can

interact with and control machines. It was tested for various gesture positions of the hand. The glove showed good sensitivity and a meaningful change in resistance for different gestures. This enabled us to manipulate many gestures using different threshold values of resistance to define multiple states. This novel approach for entirely textile based sensing glove has remarkable potential to get rid of rigid electronic sensors from wearable systems. The additional benefit of this work can be found in tele operations, sign language systems for deaf and dumb individuals, to control robot remotely for bomb disposal, radioactive laboratories, space explorations and other risky environments.

Keywords: wearable electronics, strain sensors, glove, HMI, gesture

Spunbond Technical Textiles in Pakistan: Project Cost a nd Profitability Projections

A. M. Rehan Abbasi[1], Syed Zameer Ul Hassan[1]

[1] BUITEMS, Takatu Campus, Quetta, Pakistan

rehan_abbaci@hotmail.com

Abstract

The textile products are the most important manufacturing sector of Pakistan partaking great production chain with intrinsic potential for value addition at every stage of processing from ginning, spinning, fabric forming, dyeing/printing and finishing made up garments. Pakistan still lags in the production of technical textiles as neither the Pakistan Government not the ordinary to top textile industry has made any sincere efforts towards synchronizing textile products with the emerging requirement of the global market by manufacturing higher value-added products. Although the textile sector is the main pillar of Pakistan's economy, overlooking the market scope of Technical Textiles and knowledge based products. This paper highlights and demonstrates the project cost and profitability projections of spunbond Technical Textile industry in Pakistan aiming towards guiding and helping the entrepreneurs to set going the project of spunbond manufacturing plant.

Study of Functional Characteristics of Woven/Knitted Hybrid Textile Composite

Usman Ahmed[1]

[1] School of Textile and Design, University of Management and Technology, Lahore

usman.ahmed@umt.edu.pk

Abstract

Composite materials exhibit good mechanical properties with low bulk density. To compare some mechanical properties of composite material, four types of textile composites were made from cotton fabrics as reinforcement and unsaturated polyester as matrix using vacuum bagging technique. The woven (6/1 satin) and knitted (1×1 rib) fabrics were manufactured from Ne 30/1 cotton yarn in the areal density of 215 ±5 and 225 ±5 respectively. Each reinforcement consisted of four layers of woven and/or knitted fabrics. The first set of reinforcement consisted of four layers of woven fabrics, the second set consisted of two outer layers of woven and two inner layers of knitted fabrics, the third set consisted of two outer layers of knitted and two inner layers of woven and the fourth set of reinforcement consisted of four layers of knitted fabrics. The results showed that the tensile strength of textile composite made with reinforcing set 1 had the highest and set 2 with lowest value. In case of bending strength result, the textile composite set 1 showed highest and set 3 lowest values. While the impact strength of textile composite set 4 was highest and set 1 was lowest.

Keywords: composite, knitted composite, hybrid composite, rib knitted, satin weave

Study of Structural Performance and Durability of Textile Reinforced Concrete

Hafsa Jamshaid[1]

[1] Department of Knitting, National Textile University, Faisalabad

[2] Protective Textile Research Group, National Textile University, Faisalabad

hrntu@hotmail.com

Abstract

The applications related to construction industry have a vital involvement of composite materials over the past decade due to their multifold advantages. Textile reinforced concrete (TRC) is an innovative high performance composite material consisting of textiles embedded in a fine-grained concrete matrix. Textile Reinforced Concrete (TRC) is rapidly replacing conventional materials due to its promising features. The aims of this article is to understand the bonding characteristics between varied yarns structures and cement matrix which was studied by yarn pull out test. In this work, effect of accelerated ageing in alkaline environment for different types of fibers was studied in order to comparatively evaluate their weight loss and reduction of tensile strength.

Keywords: textile reinforced concrete (TRC), durability, basalt, aging

Study the Comfort Properties of Conductive Fabrics made by Nanotechnology

Azam Ali[1], Vijay Baheti[1], Jiri Militky[1], Blanka Tomkova[1], Hafiz Faisal Siddique[1]

[1] Technical University of Liberec, Czech Republic

mehr_azam91@yahoo.com

Abstract

The vision behind wearable conductive textile forecasts future electronic systems to be an integral part of our everyday outfits. Such electronic textile have to meet special requirements regarding wearability. When we talk about the wearable Conductive fabrics, then comfort is the really parameter from which we cannot avoid. The objective of current study was to manufacture the multifunctional and wearable electrically conductive fabrics by considering their comfort properties. Durable cotton fabrics were made by in-situ deposition of silver particles. The dynamic light scattering, and SEM were employed to study the morphology of deposited silver particles. The effectiveness of conductive fabrics was analyzed for electromagnetic shielding ability over frequency range of 30 MHz to 1.5 GHz. The EMI shielding was found to increase with increase in concentration of silver particles. Similarly, the effect of Comfort and mechanical properties were also studied. Furthermore, the role of deposited silver particles on antibacterial properties was examined against pathogenic bacteria such as Staphylococcus aureus and Escherichia coli. At the end, the durability of coated fabrics against comfort and electrical properties were examined against several washing cycles. The fabrics showed good retention of the silver particles, proved by SEM microstructures and small loss in the conductivity of the material after washing.

Techno-mechanical Properties of Cocoon Filament of Mulberry Silkworm (bombyx mori l.) Strains

Zahid Rizwan[1], Yasir Nawab[1], Muhammad Umair[1], Ghulam Ali Bajwa[2]

[1] National Textile University, Faisalabad

[2] Pakistan Forest Institute, Peshawar

gabajwa64@gmail.com

Abstract

The earliest evidence of the use of silk outside China was found in Harappa, Pakistan. Due to superior techno-mechanical properties of silk, its uses are as old as 2500-2000 BC in this part of the world. Present study was conducted to assess the techno-mechanical properties of two strains of Mulberry Silkworm (Bombyx mori), one each of Chinese and Japanese origin. The results showed a highly significant variation in commercial and raw silk traits. 205PO, Chinese strain, produced dry cocoon of 0.61±0.04 g with raw silk of 0.30±0.02 g. J101, Japanese strain, produced dry cocoon of 0.49±0.01 g with raw silk of 0.23±0.00 g. 205PO yielded a filament of 1203.1±20.42 m/cocoon of 2.26±0.15 Denier, while J101 yielded a filament of 1082.3±48.95 m/cocoon of 1.91±0.06 Denier. The overall multiple evaluation index (MEI) of 205PO, based on 11 quantitative traits, was 53.29, while MEI of J101 was 45.67. The mean tenacity of 205PO silk filament was 33.67±4.47 cN/Tex, while the tenacity rupture was 28.35±1.46 cN/Tex. 205PO filament resulted in strain yield of 6.33±0.66% and tensile strength of 0.085±0.019 N/cm. J101 silk filament showed 6.24%, 24.62% and 4.42% greater tenacity, tenacity rupture and strain yield compared to 205PO. Contrarily, the tensile strength of 205PO was 11.82% greater compared to J101. The filament

diameter of 205PO and J101 was 22.01±0.42 µm and 21.98±0.15 µm, respectively. These findings showed promising techno-mechanical properties of two tested strains of the Mulberry Silkworm. However, these properties vary with the silkworm strain. Based on these findings, it is recommended that silkworm strains with superior techno-mechanical properties may be included in breeding programmes for enhancing the quality of textile.

Keywords: mulberry silkworm, filament, commercial traits, silk, sericulture, textile

The Polyelectrolyte Behaviour of Cellulose Solutions in N,N-Dimethyl Acetamide and Lithium Chloride

Zubair Khaliq[1], Z. A. Rehan[1], Zulfiqar Ali[2], Amir Shahzad[2], Ahsan Nazir[3], Ali Afzal[2], M. Bilal Qadir[2,*]

[1] Department of Polymer Engineering, National Textile University, Faisalabad, Pakistan

[2] Department of Yarn Manufacturing, National Textile University, Faisalabad, Pakistan

[3] Department of Textile Processing, National Textile University, Faisalabad, Pakistan

Abstract

The physical properties of dilute cellulose solutions in N,N-dimethyl acetamide (DMAc) including 9 wt% lithium chloride (LiCl) were investigated in terms of concentration, temperature and molecular weight of cellulose. Over the concentration range of 0.01 to 2.5 g/dl, the viscosity of the cellulose solutions exhibited a lower critical solution temperature (LCST) behavior which proved thermoreversible between 30 and 60°C. The LCST behavior was further supported by dynamic light scattering measurement. In the extremely dilute concentration range, 0.01 to 0.08 g/dl, the reduced viscosity (ηred) of cellulose solutions was increased with decreasing concentration on account of polyelectrolyte behavior. The anomalous coil expansion with decreasing concentration could be explained by the increase of the conductivity of cellulose solutions with decreasing concentration, which was also verified by dynamic light scattering experiment. In the

* Corresponding Author: bilal_ntu81@hotmail.com

concentration range of 0.1 and 2.5 g/dl, both cellulose solutions gave a drastic increase of ηred in the vicinity of critical concentration (C*), 0.9 g/dl. The slope of the curve of ηred versus concentration was higher for the cellulose of higher molecular weight, but it did not change with temperature between 30 and 60 °C.

Keywords: cellulose, N,N-dimethylacetamide/LiCl, LCST behavior, thermoreversibility, polyelectrolyte effects

Use of Bag of Visual Words Model for Textile Image Classification and Retrieval

Muhammad Naeem[1], Rehan Ashraf[1,*], Syed Talha Ali Hamdani[1], Nouman Ali[2]

[1] Department of Computer Science, National Textile University, Pakistan

[2] Department of Software Engineering, Mirpur University of science & Technology, AJK, Pakistan

naeem_ntu@hotmail.com

Abstract

The concept of bag of visual words model vastly used in computer vision and image classification. In this article we have applied this model on multiple textile images for better prediction, classification and retrieval. In this research we have extracted local and global features and after that quantized by using SURF and SIFT descriptors which shows some discriminative power in giving solution of numerous computer vision issues, progressively many best image retrieval frameworks are attempting to depend on them. A typical approach to accomplish this aim involves quantizing nearby descriptors (local features) into visual words, and after that applying adaptable textual ordering and retrieval plans. We call this model as bag of visual words or pack of components (features) model. In content based image retrieval framework bag of visual words are used as a vector which contains the events of visual words. The objective of our work is to apply

* Corresponding Author: rehan@ntu.edu.pk

this model on textile images and present diverse technique when assembling the framework in light of this model.

Keywords: bag of visual words, visual vocabulary, image retrieval, haar wavelet transform, k-means clustering, support vector machine. textile images

Why Nanofibers are the better choice for Technical Textile Applications?

Zeeshan Khatri[1] and Farooq Ahmed[1]

[1] Nanomaterials Research Lab, Department of Textile Engineering, Mehran University of Engineering and Technology, Jamshoro

zeeshan.khatri@faculty.muet.edu.pk

Abstract

Electrospun nanofibers are considered as one of the safest nanomaterials due to their extremely long length and their ability to be embedded within another media. Recent advancement in mass production of nanofiber has made it practical to use nanofibers in many emerging fields. In many technical applications, nanofibers always serve as a better candidate than the conventional fibers. The prominent and potential applications of nanofibers are in filter media, biosensors, wound dressings, controlled drug release, tissue engineering scaffolds, smart protective clothing, energy, and environment and many other emerging fields. This special talk is intended to present Why nanofibers are the better choice for technical textile applications? Moreover, the content shall give insight into the recent challenges and technological advancement in production of nanofibers and their application in technical textiles.

Keywords: nanofibers; electrospinning; technical fibers; membranes; smart textiles