The Institute of Textile Science

2022 Symposium
Abstracts of Students' Presentations

Cinnamon oil loaded chitosan nanoparticle finish for preserving museum textiles

Ankita Shroff[1](PhD in Clothing and Textiles), Anjali Karolia[2], Devarshi Gajjar[3] and Patricia Dolez[4]
[1, 2] Department of Clothing and Textiles, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, India.
[3] Department of Microbiology, Faculty of Science, The Maharaja Sayajirao University of Baroda, India.
[4] Department of Human Ecology, University of Alberta, Canada.
Presentation time: Tuesday March 8 at 12:30 pm MT/2:30 pm EST

Museum textiles and costumes are unique, valuable, and fragile records of our past. They are difficult to preserve as they are typically made of natural fibers (cellulosic and proteinic), which create a rich environment for microbes that leads to biological deterioration. In this study, Cinnamon oil loaded chitosan nanoparticles were prepared by an emulsion and ionic gelation method with an encapsulation efficiency of 75% and an average size of 200nm. The nanoparticles were sprayed and padded on a fine cotton fabric, which was then tested for its antibacterial repellency towards *Bacillus cereus, Staphylococcus aureus, Pseudomonas, and Escherichia Coli.* The results showed good efficacy towards the gram positive bacteria as compared to the gram negative. This fabric can be used as a wrapping, lining, backing and covering material when textiles are stored on shelves, in drawers or in boxes, and to pad hangers and rollers for displays in the museums.

Blood Memory & Bush Tanning

Teresa Vander Meer-Chassé (Ddhälh kït Nelnah) - Master of Fine Arts in Studio Arts, specializing in Fibres and Material Practices
Department of Design and Computational Arts Textile Sciences, Concordia University
Presentation time: Tuesday March 8 at 12:45 pm MT/2:45 pm EST

I have often heard Indigenous cultural practices being referred to as *lost*, *dead*, or *forgotten* within both academia as well as in mainstream society. I argue that our cultural practices and teachings are merely sleeping, waiting to be awoken. And the awakening of these practices is happening as we speak. Indigenous communities are seeing a rise in the reclamation of hide tanning practices. Inspired by this act of revitalization, I embarked on my own education of tanning practices within my community of Beaver Creek, Yukon in the summer of 2021. Through an ongoing mentorship with my Grandma Marilyn, and a bit of experimenting, I learned what it takes to process a moosehide. I gained an appreciation for the elder techniques passed down to me through countless generations. The knowledge of creating a useable textile from nature is the origin of textile science and something to celebrate.

Effect of Ultraviolet Radiation Exposure on Tear Strength by Trapezoid Procedure in Moisture Barriers Used in Firefighters' Protective Clothing

Laura Munevar-Ortiz[1,2] (PhD Student in Textile Science and Chemical and Materials Engineering), John A. Nychka[2], and Patricia I. Dolez[1]
[1]Department of Human Ecology, University of Alberta
[2]Department of Chemical and Materials Engineering, University of Alberta
Presentation time: Tuesday March 8 at 1:00 pm MT/3:00 pm EST

Moisture barriers are an essential layer in firefighters' protective clothing. They prevent liquid entry while allowing body perspiration to exit. It has been shown that exposure to ultraviolet (UV) radiation negatively impacts the performance of fire-protective clothing. This study aims at examining the effect of accelerated UV aging at different irradiances (0.68-1.35 W/m2 at 340 nm) and temperatures (50-80°C) on the tear strength of moisture barriers (measured by the trapezoid procedure). Three models of moisture barriers commonly used in firefighters' protective clothing were assessed. The results, in terms of residual tear strength, were analyzed by analysis of variance (ANOVA) and post hoc tests. It was found that all three moisture barriers are strongly affected by UV aging; they retained only 10-20% of their original tear strength at the longest aging time, which may be associated with the high sensitivity of aramid fibres to UV aging.

Superhydrophobic PDMS-cotton via green W/O/W emulsion approach

Camille Venne[1](M.Sc. student in Energy and Materials), Alireza Saidi[1,2], Nhu Nang, Vu[1], Phuong Nguyen-Tri[1]
[1] Department of Chemistry, Biochemistry and Physics, University of Quebec at Trois-Rivieres
[2] Institut de recherche Robert-Sauvé en santé et en Sécurité du travail (IRSST)
Presentation time: Tuesday March 8 at 1:15 pm MT/3:15 pm EST

Cotton is a well known renewable material used to make reusable personal protective equipment such as lab-coats and protective clothing. However, the fabric itself does not resist highly corrosive chemicals and exhibits a low bacterial protection for users. The main objectives of this project are to design an eco-friendly, cost-effective and simple approach to prepare superhydrophobic cotton that prevents bacteria adhesion and corrosive chemicals using a simple dip-coating process using a water/oil/water (W/O/W) emulsion containing polydimethylsiloxane (PDMS). The W/O/W emulsions are made through high speed mechanical agitation technique using polyvinyl alcohol as emulsifying agent. This method is considered as a green method due to a small amount of PDMS and no solvent and no super sophisticated installation are needed. The PDMS@COT presents a water contact angle (WCA) over 160°, which is well resistant to alkaline and acidic solutions and also reduce the bacteria adhesion to its surface compared to untreated cotton.

Sustainable Coloration of Cotton Fibers with Nanopolysaccharide Materials

Senay Yacob Baraki[1] (Ph.D. in Textile Chemistry, Dyeing, and Finishing Engineering), Lei Ding [1, 2]
[1] Key Lab of Science and Technology of Eco-textile, Ministry of Education, College of Chemistry, Chemical Engineering and Biotechnology, Donghua University, Shanghai, People's Republic of China
[2]Innovation Center for Textile Science and Technology of Donghua University, Donghua University, Shanghai 201620, People's Republic of China
Presentation time: Tuesday March 9 at 9:00 pm MT/11:00 pm EST

The development of green dyeing technology from renewable, natural sources have attracted much attention in the field of environmentally friendly coloration of textile materials, however, the use of nanofibrils materials is still minimal. Here, we prepared a sustainable coloration of cotton fibers based on nanopolysaccharide materials. The nanopolysaccharide materials namely regenerated cellulose (RC) and regenerated chitin (RCh) were prepared by acid hydrolysis followed by mechanical process. According to transmission electronic microscope study the average length of regenerated cellulose (RC) fibrils was measured in the diameters ranged from

20 to 50 nm and lengths of a few of hundred nanometers were as regenerated chitin (RCh) fibrils have length in the range of micrometers and their diameter was 50 nanometers length. Both the regenerated cellulose (RC) and regenerated chitin (RCh) suspensions were dyed with reactive dye and a mixture of paste was prepared to color cotton fabric via a simple coating system. The results of scanning electronic microscope demonstrated that the dye paste was evenly deposited on the textile substrates and blocked in between of the fibers. Furthermore, the color fastness results revealed that the dyed cotton fabrics with RC and RCh shows comparable coloration performance to the conventional coloration method. Therefore, the use of renewable and biodegradable polymers as colorant demonstrated potential for replacing conventional dyeing method, which opened broadens prospects in coloration of textile materials.

Thermal insulation capacity of cold protective clothing materials in extreme environmental conditions

Mohamed Zemzem (Postdoctoral fellow), Ludwig Vinches, and Stéphane Hallé
Department of Environmental and Occupational Health, University of Montreal
Presentation time: Tuesday March 9 at 9:15 pm MT/11:15 pm EST

Thermophysiological comfort in a cold environment is mainly ensured by clothing. However, thermal performance and protective abilities of textile fabrics could be sensitive to extreme weather conditions.

In this regard, thermal insulation capacity and air permeability of three technical textile assemblies were experimentally assessed. A sweating guarded hot plate apparatus, commonly called “Skin Model” and based on ISO 11092 standard, was adopted for the thermal resistance measurements. Besides, the influence of environmental parameters (temperature, humidity and wind speed) on their insulation capacity was determined.

It was found that the assemblies lose about 85% of their thermal insulation with increasing wind speed from 0 to 16 km per hour. Under certain conditions, values approaching 1 clo have been measured. On the other hand, the results showed that temperature variation from -40 to 30 °C as well as humidity changes have a limited influence on the thermal insulation of the studied assemblies.

Effect of Air Gap on the Dry Thermal Resistance of Sportswear Fabrics

Md Rashedul Islam(PhD Student in Textile Sciences) Farzan Gholamreza[2], Kevin Golovin[3], Patricia I. Dolez[4]
[1] Department of Human Ecology, University of Alberta
[2] Postdoctoral Fellow, School of Engineering, The University of British Columbia
[3] Assistant Professor, Department of Mechanical & Industrial Engineering, University of Toronto
[4] Assistant Professor, Department of Human Ecology, University of Alberta
Presentation time: Tuesday March 9 at 1:30 pm MT/3:30 pm EST

The measurement of a fabric's dry thermal resistance (Rct) according to the standard test method ISO 11092 involves direct contact between the fabric specimen and the test plate. This overlooks the effect of the air gap between the clothing and the human skin on the Rct results. This study investigates the effect of the air gap thickness between the hot plate and the fabric specimen on Rct for a series of sportswear fabrics. The results show an initial increase in Rct values with air gap thickness. After reaching a maximum at 12 mm, the fabrics' Rct values decreased then reached a plateau. This was attributed to the onset of natural convection for larger air gaps. These results show the importance of considering the effect of the air gap when characterizing clothing comfort performance.

Letting Go Through Creating Assemblages of Paper, Debris, and Electronics

Tricia Enns (MSc Student in Design and Computational Arts)
Department of Design and Computational Arts, Concordia University
Presentation time: Tuesday March 9 at 1:45 pm MT/3:45 pm EST

Over the past year I have been exploring the use of soft electronics in combination with conductive situated debris in handmade paper to explore themes of temporality, interactivity, and materiality. The process introduces many variables to the electronic circuitry, often involving sensors and microchips, causing circuits to react and act in unexpected ways, and thus allowing the materiality of these assemblages to take center stage. Within the presentation the process, current outcomes, and future of the project will be discussed in relation to how these assemblages can and will evolve over space and time to provide new understandings of place.