CAMX

THE COMPOSITES AND ADVANCED MATERIALS EXPO

2018 CAMX POSTER SESSION

AWARD AND AUTHOR MEET-AND-GREET

KAY BAILEY HUTCHISON CONVENTION CENTER

EXHIBIT HALL E

WEDNESDAY, OCTOBER 17

2:00 – 4:00 PM

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Connecting the materials community

CAMX is pleased to have the participation of the next generation of researchers, engineers and industry professionals in the 2018 CAMX Poster Session. Browse poster displays throughout CAMX to see which universities and organizations are pioneers of composites research and how their advancements may impact business. Posters are judged on overall presentation, significance to the advancement of composites and advanced materials, and commercial application.

Thank you to all who submitted!

ENTRY PS18-0008

Load-Path Optimized Design of FRP-Structures by The Use of Tailored Textiles

This poster provides an overview regarding the evaluation process for TT technologies by using an automotive part. The approach is to integrate the developed concept into the conventional product development process. At first, a preliminary laminate design is de-fined. By using topology-optimization, the load-paths are identified and the positions of the necessary reinforcement structures are derived. Based on the gained information, suitable TT-production-technologies are identified. For this purpose, possible part concepts resulting from the combination of different reinforcement structures are generated. Finally, the identified part concepts are evaluated regarding their lightweight and economic potentials by comparison to a quasi-isotropic part.

RWTH Aachen University, Lehrstuhl für Textilmaschinenbau – Marius Wiche; Carsten Uthemann; Thomas Gries

ENTRY PS18-0012

Enhanced Mechanical and Radar Absorbing Properties of Carbon/Glass Fiber Hybrid Composites with Unique 3D Orthogonal Structure

Poly (vinylidene difluoride) (PVDF) has been widely used in piezoelectric applications as films and nanofiber mats to detect various human motions include breathing, drinking, and eating but there are limited publications on piezoelectric melt-spun fibers. In this work, PVDF fibers were prepared using the melt spinning method, and the processing parameters, including the heat setting temperature, diameter of nozzle, drawing ratio, were controlled in the continuous melt spinning system to form uniform fiber. Then the PVDF fibers were stretched and poled to increase the ß-phase crystallinity and align the molecular dipoles.

University of North Texas – Wei Fan, PhD; Nandika Anne D'Souza
Xi'an Polytechnic University – Bugao Xu

ENTRY PS18-0015
Investigating Material Property Variability of Natural Fibers

The significant potential of bast fibers, and other bio-industrial materials, is often placed within the context of known applications. However, the really exciting aspect is the potential opportunity for bio-industrial materials in unknown areas. Proper material characterization and value assessment are critical to realizing these opportunities. In pursuit of this goal, this study investigates and attempts to mitigate the sources of variability in material property data of natural bast fibers. The study is part of the Bio-industrial Materials Initiative (BMI), which aims to act as an anchor connecting and educating farmers, material processors, and end-users of natural fibers.

State University of New York; New Paltz – Hanami Robles; Bryan Feigel

ENTRY PS18-0017
Carbon Fibre Reinforced Phenolic Composites with Near 100% Recyclability Through Dynamic Boronic Ester Bonds

Both environmental and economic factors have driven the development of recycling routes for the increasing amount of composite waste. The goal of this work is to create reversible thermosets using dynamic boronic ester bonds as cross-links instead of traditional irreversible covalent bonds. By combining the reprocessability of thermoplastics with desirable thermal stability of thermosets, controlled degradation and fully recycling of carbon fibre-reinforced polymer (CFRP) composites at ambient condition were realized through gentle alcoholysis. The multiple recycling experiments revealed near-total recovery of the clean fibre and binder materials, which could be reprocessed into composites with similar mechanical properties as fresh materials.

Xi'an Jiaotong University – Shujuan Wang; Xinli Jing; Xiaolong Xing; Xiaoting Zhang

ENTRY PS18-0018
Green Composites: Review of Natural Fiber Reinforced Polymer Composites

This poster provides a general review in the field of natural fiber reinforced polymer (NFRP) composites utilizing laminates made of flax or hemp to replace the synthetic materials such as carbon fiber and fiberglass. The natural fibers are low in cost, high in specific properties, environmentally friendly, and biodegradable. This review aims to highlight recent developments and give an overview of the benefits and drawbacks of using natural fibers in composites especially with the increasing demand for more sustainable materials and the shift to environmentally clean and green composites in the world of material science.

Lafayette College – Alexander Homsi; Rachel Striker Koh, PhD

ENTRY PS18-0019
Strengthening of Laterally Damaged Bridge Girder with Pre-saturated CFRP and Different Types of Anchors

The most failure mode that causes premature failure for strengthened structures with CFRP is debonding. New types of anchors were studied in this research to delay /prevent debonding of CFRP. The types of anchors that were used in the research were a mechanical anchor, FAN anchor, and u-wrap. Also, pre-saturated CFRP tested until failure for strengthening laterally damaged prestressed concrete bridge girder.

The University of Texas at Arlington – Tariq Aljaafreh; Eyosias Beneberu, PhD, P.E.; Nur Yazdani, PhD, P.E.

ENTRY PS18-0020

NextGeneration Multifunctional Composite System for Resilient Infrastructure

The Achilles heel in any structural system performance is the joint, especially in multistory structures subjected to hurricanes, earthquakes and blast loads. A multifunctional composite system invented by researchers at West Virginia University will allow a bridge or building system to resist extreme events while saving thousands of lives by avoiding catastrophe. This system can economically refurbish (~1% of the structure replacement cost) thousands of buildings in California and elsewhere without ripping and replacing, thus reducing the $2 trillion infrastructure funding gap.

Benjamin M. Statler College of Engineering and Mineral Resources/West Virginia University – Praveen K.R. Majjigapu; Hota V.S. GangaRao; Ruifeng R. Liang

ENTRY PS18-0021

Performance Prediction of Heterogeneous Material Systems using Broadband Dielectric Spectroscopy

UTARI IPPM researchers have developed a method of using Broadband Dielectric Spectroscopy (BbDS) to detect the strength and integrity of structural composite materials, adhesive bonds and additive manufactured coupons. This is achieved by measuring dielectric properties of those heterogeneous material systems and showing direct relationships to the strength of those structures through data driven knowledge and showing unique links between changes in the bulk dielectric response and remaining strength and life.

Department of Mechanical and Aerospace Engineering, UTA & Institute for Predictive Performance Methodologies, UTARI – Vamsee Vadlamudi; Muthu Ram Prabhu Elenchezhian; Md Rassel Raihan; Kenneth Reifsnider

ENTRY PS18-0022

3-D Printed TiO_2 Foams for Space Application

In this presentation we will discuss our recent studies on the ink formulation approach, the rheological properties of the foam inks, their 3D printing characteristics, the effect of processing on the resulting microstructure, initial photocatalytic performance as well as mechanical compression behavior.

Benjamin M. Statler College of Engineering and Mineral Resources/West Virginia University – Iole Pecora; Maria Torres Arango; John Kuhlman; Kostas Sierros

ENTRY PS18-0023

Carbon Nanotube-Based Novel Flexible Sensors for Human Motion Analysis

A novel manufacturing process is used for creating thin flexible carbon nanocomposite films to create piezoresistive fabrics using everyday fabrics such as Kevlar, Cotton, and Polyester. The flexible sensors have a variety of applications in prosthetic devices, smart garments, e-skins for robot and pressure sensing skins. Applications for detecting joint motion at the knee during walking, standing/sitting processes is discussed. Low-cost customized smart footwear is created by integrating multiple sensors in the sole of the footwear and used for detecting gait imbalances. The sensors response is validated using state-of-the-art force plates.

University of Delaware – Sagar M. Doshi; Amit Chaudhari; Collene Murray; Prof. Erik Thostenson

ENTRY PS18-0026

Carbon Nanotube/Carbon Composites: A Comparative Study on Different Fabrication Processes

This study focuses on the two mainstream manufacturing routes: chemical vapor infiltration (CVI) and cyclic polymer infiltration pyrolysis (PIP), inspired by those of CF/C. By controlling the deposition conditions such as carbon source flow rate, temperature and time, pyrolytic carbon (PyC) was infiltrated within the CNT network as the carbon matrix precursor.

Florida State University, High-Performance Materials Institute – Liyu Dong; Songlin Zhang; Charlie Cruzan; Dr. Jin Gyu Park; Dr. Ayou Hao; Dr. Richard Liang

ENTRY PS18-0027

Lightweight Carbon Nanotube Conductor with High Electrical Conductivity for Scale-up Manufacturing and Conductive Fibre-Reinforced Composite Application Study

This study focuses on the two mainstream manufacturing routes: chemical vapor infiltration (CVI) and cyclic polymer infiltration pyrolysis (PIP), inspired by those of CF/C. By controlling the deposition conditions such as carbon source flow rate, temperature and time, pyrolytic carbon (PyC) was infiltrated within the CNT network as the carbon matrix precursor.

Florida State University, High-Performance Materials Institute – Liyu Dong; Songlin Zhang; Charlie Cruzan; Dr. Jin Gyu Park; Dr. Ayou Hao; Dr. Richard Liang

ENTRY PS18-0028

Chemically Linked Particle Network Composites

The poster describes a novel composite material technology, Chemically Linked Particle Networks wherein inorganic particles are incorporated as “monomer” units into polymer chains to produce materials with enhanced mechanical properties (strength, stiffness, toughness) when compared with conventional particle-filled polymer composites. The technology is targeted for direct 3D printing of lightweight load-bearing structural parts that may be used as a direct carbon-fiber reinforced polymer replacement, or as a replacement for some metal parts in industries such as aerospace and automotive.

PARC, a Xerox Company – Dr. Gabriel Iftime; Junhua Austin Wei; Eugene Beh; Rahul Pandey; Jerome Unidad; Michael Benedict; Jamie Kalb; David Johnson; Jessy Rivest; Antonio Williams

ENTRY PS18-0029

A Micromechanics-Based Viscoelastic Processing Model for Predicting Residual Stress in Fiber-Reinforced Composites

The proposed micromechanics-based multi-scale analysis and multi-physics processing model framework can help to accurately predict the residual stress in fiber-reinforced composites with different microstructures, such as the unidirectional composites, 2D textile composites etc. The viscoelastic constitutive laws can better calculate the residual stress increments compared with other popular elastic constitutive laws.

University of Connecticut – Weijia Chen; Dianyun Zhang

ENTRY PS18-0030

Nonparasitic Behavior of Embedded Triboluminescent Sensor in Multifunctional Composites

In situ Triboluminescent Optical Fiber (ITOF) sensors are embedded into the composites for real-time distributed damage monitoring. Real-time damage sensing in large composite structures is imperative to allow for necessary actions before catastrophic failure occurs. This article investigates how embedded ITOF sensors affect the tensile and flexural properties of composites. Ultimate tensile strength and shear strength of composites with embedded 275 µm reduce by about 0.15% and 1.41%, respectively when embedded in 0° direction. ITOF sensors demonstrated its ability to monitor the low velocity impact damage in composites. The small diameter sensors demonstrate nonparasitic behavior in multifunctional composites.

Florida A&M University and Florida State University, College of Engineering – Md Abu Shohag; Okenwa Okoli

ENTRY PS18-0031

Experimental Study on Flexural Behavior of Composite Sandwich Beams Reinforced with Lattice Ribs and Profiled Steel Sheeting

This study proposed a novel GFRP-profiled steel sheeting composite sandwich beam (GPSS beam) composed of glass fiber reinforced polymer (GFRP) skins, a lightweight polyurethane (PU) foam core and a 0.9-mm-thick profiled steel sheeting. The flexural performance of the GPSS beams was studied through experimental and analytical methods. Test results demonstrated that the bending stiffness and ultimate load-bearing capacity can increase up to 306% and 158%, respectively compared to those of the control specimen.

Jiangsu University – Dr. Fubin Zhang
NanJing Tech University – Weiqing Liu; Hai Fang

ENTRY PS18-0033

Modeling Failure in Fiber-Reinforced Composite Tubes Using Multiscale Technology

Poster will go over the motivation, process, and results of a novel method for performing composite tube structural analysis. The multiscale methodology not only shows increased accuracy by utilizing FE2 theory, but it also demonstrates the ability to capture manufacturing variability. Engineers can utilize this method to create a range of results, which has not been shown previously in virtual testing and simulation.

MultiMechanics – Kennedy Neves; Hayden Cornwell; Luiz Lima; Leandro Castro; Flavio Souza

ENTRY PS18-0035

Sensing of Damage Progression in Glass Fiber Composites Coated with Carbon Nanotubes Using Electrophoretic Deposition

Microcracks occur at relatively low strain levels for glass fiber composites, but can result in failure over extended loading. Carbon nanotubes (CNTs) can reinforce the fiber/matrix interface/interphase and thus improve durability. They also create a conductive network which is disrupted by these cracks. An analysis will be provided on the influence on CNTs on crack propagation while trying to detect crack formation in situ using these nanotubes.

University of Delaware – Colleen M. Murray