Composites & Smarts

Materials and Structures

No. 1, Jan. 2023

Electronic NEWSLETTER

MoU signed between IIT Delhi, India and K.N. Toosi University of Technology Tehran, Iran

Editorial Message

Human progress has made the use of new materials inevitable, and it has become undeniable. Maybe yesterday's human never imagined that one day these materials can play such a key role in his life. The rapid development of the current industrial world requires equipment with a higher production rate, longer life and better reliability, more accuracy and resistance to tougher working conditions. Certainly, increasing the knowledge of the scientific and industrial communities of the country in relation to new engineering materials is an introduction to expanding the use of these materials and finding benefits as one of their wonderful features in different parts of life. Composite and smart materials and their use and application for various structures are nowadays one of the keys for better satisfaction of human life in many fields for their future life.

It makes me happy that with the help of honorable professors and respected students, I was able to prepare this newsletter named as Composite and Smart Materials and Structures to inform scholars and researchers in the fields of composite and smart materials and structures and make it available electronically. This electronic newsletter is a collaboration work of K. N. Toosi University of Technology in Tehran, Iran and the Indian Institute of Technology in Delhi, India, and both the professors and the students from the faculties of Applied Mechanics, Mechanical Engineering, Materials Science and Engineering, Textile and Fiber Engineering, and Civil Engineering from both institutes are participated. It is hoped that researchers and scholars will accompany and support us for this and I welcome any suggestions to improve the contents and present the newsletter properly and more useful.

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Prof. S. Kapuria

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Ph.D. thesis

LOW VELOCITY IMPACT STUDY ON BASALT FIBER REINFORCED UNI-DIRECTIONAL AND PLAIN-WOVEN COMPOSITES: MECHANICAL CHARACTERIZATION AND NUMERICAL MODELING

Mr. MOHIT GUPTA (2020)

Supervisor: Prof. Puneet Mahajan (Applied Mechanics)

Sensitivity to impact damage arising due to tool drops, hail stones, bird strike etc. poses serious threats as the damage is tough to detect from visual inspection. Basalt, a mineral fiber obtained from rocks requires less chemicals during processing compared to glass and carbon, but its composites are less explored in their mechanical performance and low velocity impact (LVI) behavior. The present thesis emphasizes on developing constitutive models for Uni-Directional (UD) and Plain Woven (PW) lamina and their mechanical characterization for providing inputs to the proposed models to simulate numerically the response under LVI cross-ply and PW laminates. Tensile and compressive tests were conducted on UD and PW laminates to evaluate the moduli and strengths of lamina in longitudinal and transverse directions. Intralaminar fracture toughness in tension and compression were obtained using Compact Tension (CT) and Compact Compression (CC) tests. Continuum Damage Mechanics (CDM) based elasto-plastic constitutive laws were developed for both UD and PW lamina using a three-dimensional plastic potential function. The elastic stiffness in different directions was degraded once damage initiation criteria were satisfied. These constitutive models for UD and PW materials were implemented in a user subroutine, VUMAT for ABAQUS/Explicit and used to predict the force-time, displacement response of laminates of these materials under LVI. LVI experiments at different impactor velocities were also performed on cross-ply and PW laminates using drop weight impact tester. The force-time and displacement response from the simulations matched with those obtained from experiments.

Ph.D. Thesis

An Experimental and Numerical study on Kevlar-Polypropylene Hybrid Nonwovens and Fibreweb Composite

Ms. Gargi Jaiswal (2021)

Supervisors: Prof. M.K. Singha (Applied Mechanics)

Prof. Dipayan Das (Textile Technology)

The short-fibre based “nonwoven fabrics” are recently being used in transportation and infrastructural industries in addition to various products of decorative, filtration, insulation and disposal nature. In this thesis attempt is made to improve the understanding of mechanics of “needle-punched nonwoven” and short-fibre based “fibreweb composite” by a combined experimental and theoretical/numerical approach. Thesis is focussed on the tensile stiffness and strength of “needle-punched nonwoven”, prepared from short fibre. Thesis also deals with the Kevlar-polyprolylene fibreweb composite. These two mixed together to prepare the hybrid nonwoven. These fibreweb reinforced composites are tested for physical properties such as density, volume fraction, void fraction and the fibre orientation. Thereafter experimental investigation is carried out to determine the stiffness, strength and failure mechanism of fibreweb composite under tension, compression, shear, bending, and impact loads.

The use of lightweight composites in Sports equipment for the disabled- Carbon Fiber Reinforced composite prosthetic legs

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Research opportunities

1-**Recruitment of Junior Research Fellow in Materials Science & Technology**

Indian Institute of Technology (BHU) Varanasi

Project title - Multifunctional Nanostructured Mn/Fe doped CeCrO3 for Photocatalyst and Magnetic Switching

apply on or before 27 Jan 2023

link - https://www.iitbhu.ac.in/positions

*2-***Prof. Bhabani K. Satapathy**

(Department of material science and Engineering , IIT DELHI)

The group is actively looking for research fellows who would like to work in the Research areas highlighted in the web page.

Please feel free to contact at
(Bhabani.kumar.Satapathy@mse.iitd.ac.in)
Link-
https://sites.google.com/view/bksatapathy/research

3- ***Prof. Santosh Kapuria***

(Department of Applied Mechanics ,IIT DELHI)

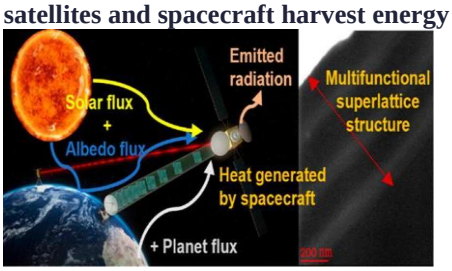
Project/Ph.D. Positions available:

Post: Project Scientist/JRF
Qualification:
First Class in M. Tech. in Mechanical Engg. / Applied Mechanics/
Structural Engg. or relevant discipline from a reputed institute.

If you have an excellent academic background, have interest in solid mechanics, and are willing to pursue Ph. D. in the area of composite structures, smart structures, structural health monitoring, digital twins, nanomechanics, active vibration control etc, lease write to me with your CV
at
kapuria@am.iitd.ac.in.
link - ***https://web.iitd.ac.in/~kapuria/***

New application of composite Materials

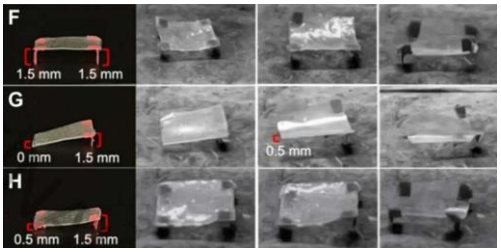
Multi-layered 'space skin' can help future satellites and spacecraft harvest energy



A research team has shown that their innovative nano-coating, called the Multifunctional Nano barrier Structure (MFNS), can reduce the operating temperatures of space-qualified structures from 120 degrees Celsius to 60 degrees Celsius. The MSFN consists of a buffer layer made of poly(p-xylylene) and a diamond-like-carbon superlattice layer to give it a mechanically and environmentally ultra-stable platform
https://phys.org/news/2023-01-multi-layered-space-skin-future-satellites.html

Jumpin' Jehoshapat! New grasshopper-like material can leap 200 times its own thickness.

Engineers at the University of Colorado Boulder have designed a new, rubber-like film that can leap high into the air like a grasshopper—all on its own and without needing outside intervention. Just heat it up and watch it jump!



The researchers describe their achievement Jan. 18 in the journal *Science Advances*.
https://phys.org/news/2023-01-jumpin-jehoshapat-grasshopper-like-material-thickness.html

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Company

Kineco Limited - World of Composites
Landspace To Aerospace

- Kineco Limited is one of India's leading enterprises in the field of composites technologies and products.
- Kineco was first company to develop an entire Skybus coach of Composites

- Kineco partered with DRDO to develop India's first Indigenous Carbon fiber reinforced light weight rapid deployable, heliportable composite bridge for military and disaster management applications and built to 'Military Load Classification' standards for 70 tonnes load.
- Kineco has emerged as the flag bearer of "Make in India in Defence" for critical composite structures.
- Kineco made India's first Composite 'Sonar Dome'- a critical component of a warship for DRDO.
- Kineco is first and the only Indian company to manufacture Composite formula Cars.

Registered Office
Kineco Limited
41 Pilerne Industrial Estate,
Pilerne, Bardez,
Goa 403511, IN
www.kinecogroup.com

Joint webinar of IIT Delhi and K.N. Toosi University of Technology

Research Laboratory and CoE

SMITA Research Lab: Centre for Excellence in Smart Textiles-IIT Delhi

Established: July 2021, Coordinator: Prof. Ashwini Agarwal, Department of Textile and Fibre Engineering, IIT Delhi

Scope: Creating a national facility, where both basic research and technology development for industrial applications are being carried out in smart textile using innovative materials such as nanoparticles, nanofibres, nano-surface engineering, phase change materials, and stimuli sensitive polymers. Specifically following areas of technologies are being pursued:
1. Stimuli (temperature, pH, and electric field) sensitive materials for applications inartificial muscles, robotics, and responsive textile, 2. Encapsulated phase change materials for thermo-regulated smart textile, 3. Inorganic phase change materials for storage and transport, 4. Nanofinishes for active functionality of textile substrates, 5. Nanofibres, organic and inorganic, using electrospinning, 6. Nano-surface engineering using atmospheric pressure cold plasma, 7. Functional coatings for textile, 8. Bicomponent and specialty fibres, 9. Fibres based on nanocomposites
 Bringing together expertise from Academia and Industry to facilitate development of new, technologies/products in the upcoming area of smart textile at par with anywhere in the world, Creating trained manpower that can assist industry in further research, product development, and production of smart textile based on new technologies.


Analytical Lab


Sample Preparation and Pilot Facility

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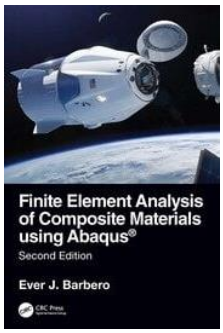
Book

Finite Element Analysis of Composite Materials using Abaqus®

2nd Edition



By
Ever J. Barbero
Copyright Year 2023

Finite Element Analysis of Composite Materials with Abaqus® shows how powerful finite element tools tackle practical problems in the structural analysis of composites. This Second Edition includes two new chapters on "Fatigue" and "Abaqus Programmable Features" as well as a major update of chapter 10 "Delaminations" and significant updates throughout the remaining chapters. Furthermore, it updates all examples, sample code, and problems to Abaqus 2020. It explains the concepts involved in the detailed analysis of composites, the mechanics needed to translate those concepts into a mathematical representation of the physical reality, and the solution of the resulting boundary value problems using Abaqus.

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Book

Fundamentals of Smart Materials,

ISBN: 978-1-78262-645-9

Editor: **Mohsen Shahinpoor**
April 2020

Smart materials are of significant interest and this is the first textbook to provide a comprehensive graduate level view of topics that relate to this field. **Fundamentals of Smart Materials** consists of a workbook and solutions manual covering the basics of different functional material systems aimed at advanced undergraduate and postgraduate students.

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Company

ROCKMAN ADVANCED COMPOSITES




Rockman Advanced Composites

A ONE STEP SHOP FOR COST-EFFECTIVE WORLD-CLASS COMPOSITES

- Rockman Advanced Composites is an Indo British enterprise and a one-stop shop for cost-effective and world-class composites certified with AS9100D & ISO 9100:2015 and over 4 decades of advanced composites solutions, and design, and manufacturing
- Rockman Advanced Composites is expertise in manufacturing moulds made up of carbon fiber prepregs & parts made up of Carbon, Glass, Kevlar, Hybrid prepregs & various types of Sandwich panels made up of rohacells, honeycomb, balsa wood, aramid core etc.
- Capabilities of designing, programming & machining of patterns, moulds & jigs made out of epoxy tooling blocks / aluminium / wood, machining of core materials & composites parts etc.

Registered Office
Rockman Advanced Composites Pvt. Ltd.
Plot no. 194,195,185,
Surat Special Economic Zone (SurSEZ),
GIDC Sachin, Surat- 394230, Gujarat, India.
www.rockmanac.com

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Conference

ICMESM 2024: 18. International Conference on Material Engineering and Smart Materials

December 16-17, 2024 in Barcelona, Spain

Important Dates

Abstracts/Full-Text Paper Submission Deadline	July 31, 2023
Notification of Acceptance/Rejection	August 30, 2023
Final Paper (Camera Ready) Submission & Early Bird Registration Deadline	July 27, 2024
Conference Dates	December 16-17, 2024

Theme of conference

Smart materials
Shape memory alloys and polymers
Electro and magnetorheological materials
Piezoelectrics, ferroelectrics, multiferroics, piezomagnetics
Electro and magnetostrictive materials
Thermoelectrics, photovoltaics, electro and magnetocaloric materials
Electrochromics, electroactive polymers, energy storage materials
Self-healing materials and multifunctional materials

Application of smart materials, structures and related technology
Fundamentals of smart materials
Modelling/formulation and characterization of smart actuators, sensors and smart material systems
Smart material systems that utilize biomimetics and bioinspiration
Smart materials utilized as sensors and actuators with applications at any scale
Smart optical materials for modification in spectral shifts and refractive index shift
Trends and development in composite materials Intelligent hydrogels
Interfacial phenomena
Phase boundaries and boundary layers of phase boundaries

For more ionformation: https://waset.org/material-engineering-and-smart-materials-conference-in-december-2024-in-barcelona

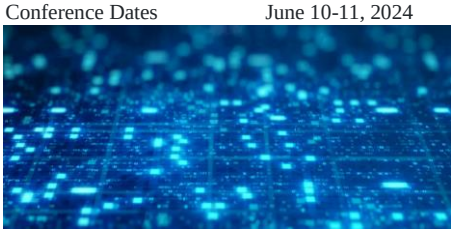
Conference

ICAALCS 2024: 18. International Conference on Advanced Applications of Lightweight Composites and Structures

June 10-11, 2024 in Ljubljana, Slovenia

Important Dates

Abstracts/Full-Text Paper Submission Deadline	July 31, 2023
Notification of Acceptance/Rejection	August 30, 2023
Final Paper (Camera Ready) Submission & Early Bird Registration Deadline	May 10, 2024
Conference Dates	June 10-11, 2024



Theme of conference

Lightweight composites and structures with high load bearing capacity
Lightweight composites and structures with thermal protective behavior or explosion protection behavior
Lightweight composites and structures with wave absorbing or transmitting behavior
Lightweight composites and structures with low thermal expansive or negative Poisson's ratio
Additive manufacturing of lightweight composites and structures
Advanced characterization methods and equipment for lightweight composites and structures

For more information: https://waset.org/advanced-applications-of-lightweight-composites-and-structures-conference-in-june-2024-in-ljubljana

News on smart composites

A nanostructured sensor constructed of carbon nanotubes has demonstrated the ability to improve parts made of glass fiber-reinforced polymer composites such as aircraft wings, wind turbine blades, vehicle bodywork, and so on. It creates heat when exposed to an electrical current; when implanted, it preserves the composite's thickness, other properties, and avoids the formation of unwanted pores. It can function as a sensor for structure health monitoring or as an anti-icing or de-icing heater.

Reactor for manufacturing nanocomposite structures at Skoltech, created by Leading Research Scientist Sergey Abaimov and PhD student Aleksei Shiverskii. Credit: Timur Sabirov/Skoltech

To know more click, https://www.jeccomposites.com/news/nanostructure-strengthens-de-ices-and-monitors-aircraft-wings-wind-turbine-blades-bridges/

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Eminent person

Santosh Kapuria, PhD, FNA, FASc, FNAE, FNASc
Email: kapuria@am.iitd.ac.in

Web: http://web.iitd.ac.in/~kapuria

He has completed his B.C.E (Civil Engg.), Jadavpur University, Kolkata in 1985-1989 (First Rank in the Department in all Eight Semesters). Then he continued his M. Tech. in M.E Structural Engg. from IISC Bangalore in 1989-1991 (First Rank among all M.E Programmes in the Dept.). Further he completed his PhD in Applied Mechanics from IIT Delhi in 1994-1997 (17 Journal Papers published from the Thesis). Now he is working as **Professor in Applies Mechanics dept. in IIT Delhi** and he received many national and international awards and many fellowships. He was the Former Director, CSIR-Structural Engineering Research Centre, Chennai & Coordinating Director, CSIR Madras Complex, Chennai. He has published more than 140 international ISI and high impact factor journals till date and presented many papers in national and international conferences. He has finished more than 15 national research and industrial projects his research interest on Smart Composite and Sandwich Structures, FGM Structures, Structural Health Monitoring, Active/Semi-Active Control of Structures, Computational Mechanics, Wave Propagation, Digital Twins, Biomechanics, Nano mechanics. He obtained more than 4200 citation and his google scholar H index is 36.

Journal

Composite Structures

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Composite Structures, an International Journal, disseminates knowledge between users, manufacturers, designers and researchers involved in structures or structural components manufactured using composite materials. The journal publishes papers which contribute to knowledge in the use of composite materials in **engineering structures**. Papers deal with design, research and development studies, experimental investigations, theoretical analysis and fabrication techniques relevant to the application of composites in **load-bearing components** for assemblies, ranging from individual components such as plates and shells to complete **composite structures**. It published more than 300 volumes.

Cite Score: 9.7, **Impact Factor:** 6.603

Review Time

The average number of weeks it takes for an article to go through the editorial review process for this journal, including standard and desk rejects. 11.1 weeks

Publication Time

The average number of weeks it takes to reach from manuscript acceptance to the first appearance of the article online (with DOI). 1.1 weeks

Acceptance Rate

Percentage of submitted articles accepted during a calendar year; the total number of articles accepted out of the total number of articles submitted in the same year, 23%.

For more information:
https://www.sciencedirect.com/journal/composite-structures