

	 <p>MoU signed between IIT Delhi, India and K. N. Toosi University of Technology, Tehran, Iran</p>	<p>Editors: Prof. SMR Khalili (KNTU) Prof. S Kapuria (IITD) Prof. S Santapuri (IITD)</p> <p>Editorial Board: DR. H. Latifi (KNTU) Mrs. A. Hossienizadeh (KNTU) Mrs. E. Sahebi (KNTU) Vagish Kumar (IITD-AM) Ravi Kant kumar (IITD-AM) Debjyoti Roy Chowdhury (IITD-CE) R Guarav Kumar (IITD-MSE) Vipin Soni (IITD-AM) Vinay Singh (IITD-AM) Jigiasu Kumar (IITD-ME) Abhijit Suresh Sahare (IITD-AM) Ms. Monde Amrutha (IITD-AM) Prashant Guarav (IITD-AM) Ms. Hela Ambati (IITD-AM) Bhaves Kumar Jha (IITD-AM) Rahul Sirwani (IITD-TFE) Ms. Kusum Saini (IITD-CE)</p>
	 <p>Iranian New Year 21 Mar. 2023</p> <p>Nowruz Mubarak! May the new year bring you good health, happiness, and success. <i>Happy Nowruz</i> to you and your loved ones!</p> <p>Please share this newsletter to your friends</p> <p><i>Editorial board</i></p>	
<p>Editorial Message</p> <p>Smart/multifunctional materials and structures are widely used in medical, automotive, energy and aerospace technologies for applications such as force sensing, actuation, energy harvesting and structural health monitoring. While a large number of smart materials exhibiting interesting multiphysics phenomena have emerged in the past few decades, only a minuscule fraction of these have been successfully translated to engineering applications. Most engineering applications, for instance, utilize piezoelectric materials and shape memory alloys (SMAs) due to their robust response, repeatability and wide availability. Thus, there is a need to enhance the response of existing smart materials to meet the technological demands. Furthermore, with recent scientific advancements in fields such as artificial intelligence, biomimetics, nanotechnology, there is a growing need for smart/responsive materials that can enable miniaturization, improve data storage and energy efficiency. To address these larger problems and to better utilize the existing smart materials, it is important that research advancements across various scientific and engineering communities come together.</p> <p>To this end, we hope that this newsletter will provide a channel for researchers at IIT Delhi and K.N. Toosi University of Technology to showcase their work and learn more about the ongoing work in this field. This in turn can improve collaborations and researchers with complimentary expertise can come together to address the larger problems mentioned above. In closing, I would like to thank Prof. S.M.R. Khalili for his efforts in bringing out this newsletter and starting the smart materials forum. These efforts will surely benefit the growing smart materials community across the two partner institutions.</p> <p>Prof. Sushma Santapuri Department of Applied Mechanics, IIT Delhi</p>		<p>Contents</p> <p>You will read in this issue:</p> <ol style="list-style-type: none"> 1. Editorial Message 2. News on Composites and Smart Materials 3. Recent Publications 4. Research Laboratory and CoE 5. Eminent Person 6. Promotions and Awards 7. Honoring the Memory 8. Upcoming Conference 9. Research Opportunities 10. Journal 11. Book 12. New Branch in Smart and advanced Materials in KNTU 13. Ph.D. thesis 14. Company <p>In case of any suggestions, comments and forwarding news, please E-mail to:</p> <p>enews.compsmart@gmail.com</p> 



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No. 3, Mar. 2023

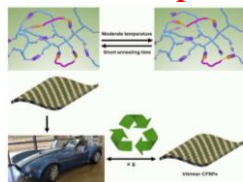
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News on Composites and Smart Materials

Novel Applications of Composites



Oak Ridge National Laboratory scientists designed a recyclable polymer for carbon-fiber composites to enable circular manufacturing of parts that boost energy efficiency in automotive, wind power and aerospace applications. Carbon-fiber composites, or fiber-reinforced polymers, are strong, lightweight materials that can help lower fuel consumption and reduce emissions in critical areas such as transportation. However, unlike metal competitors, carbon-fiber composites are not typically recyclable, meaning wider adoption could present waste challenges. "Our goal is to extend the lifecycle of these materials by making reuse possible without sacrificing performance," said ORNL's Md Anisur Rahman.

The team's approach incorporates dynamic covalent bonds that are reversible, enabling both carbon fiber and polymer recycling. The new polymer maintained mechanical strength in six reprocessing cycles, a sharp contrast to previously reported polymers. "ORNL's carbon-fiber composites enable fast processing and can be repaired or reprocessed multiple times, opening pathways to circular, low-carbon manufacturing," said ORNL's Tomonori Saito. The research was published in *Cell Reports Physical Science*.

<https://www.compositesworld.com/news/ornl-develops-recyclable-polymer-for-low-carbon-composites-manufacture>

Novel Applications of Smart Materials



While NASA's newest tire is the result of years of research and development, it was a chance meeting between old colleagues that moved it from a unique R&D project to a key piece of an upcoming mission to Mars.

The team at NASA Glenn Research Center in Cleveland engineered a tire—the Shape Memory Alloy (SMA) Spring Tire—that can handle the heavy load of a lunar rover while traversing rough, rocky Martian terrain and enduring extreme temperatures. And while the launch date is years away, the practical uses of the technology already have emerged on the consumer market.

<https://www.rubbernews.com/tire/photo-gallery-nasa-develops-tire-mars-missions>

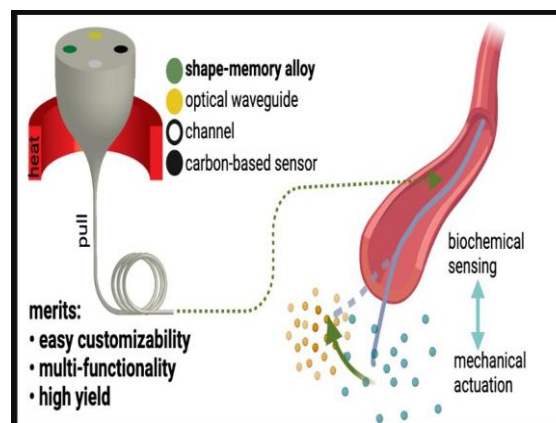
News on Composites and Smart Materials

Navigating Complex Biological Systems with Smart Fibers

Integrative actuators and sensors within a single active device offer compelling capabilities in developing robotics, prosthetic limbs, and minimally invasive surgical tools. However, instrumenting smart and active devices with miniaturized sizes for easy customizability and high yield is largely restricted by the current manufacturing technologies.

Now, a team of researchers has developed a flexible polymer-based actuatable fiber that is capable of being integrated with smart materials and biosensing composite materials. The technology may lead to technological advancements in soft and flexible robotic fields, which could open possibilities for achieving closed-loop control for high-precision operations. It has both mechanical actuation realized by the incorporated shape-memory alloy (SMA) wires and biochemical sensing provided by carbon-based composite materials.

The tip of such a fiber could be actuated with a high spatiotemporal resolution by the shape-memory effect. And, its integrated carbon composite exhibits intrinsically high sensitivity toward electroactive molecules. The actuatable fiber sensor technologies developed here can greatly push the technological advancement in the soft and flexible robotic fields to include additional functions on top of their pure mechanical behaviors and open possibilities for achieving closed-loop control for high-precision operations.



An active fiber fabricated by the thermal drawing—
Yuichi Sato et al, Shape-Memory-Alloys Enabled Actuatable Fiber Sensors via the Preform-to-Fiber Fabrication, ACS Applied Engineering Materials (2023).
<https://pubs.acs.org/doi/10.1021/acsaenm.2c00226>



Recent Publications

[Experimental research on the impact of oxygen control zone thickness on continuous layerless printing of porous polymer parts](#)

Authors: **Mohammad Salehi, Siavash Moayedi Manizani, Mohammad Shayesteh, Amir Manzour, Jamal Zamani**
Publication date: 10/3/2023

Journal: Modares Mechanical Engineering
Volume: 23, Issue: 3, Pages: 151-159, Publisher: Modares Mechanical Engineering

[Rate-dependent electromechanical behavior of anisotropic fiber-reinforced dielectric elastomer based on a nonlinear continuum approach: modeling and implementation](#)

Authors: **Marzie Majidi, Masoud Asgari**
Publication date: 1/2023
Journal: The European Physical Journal Plus
Volume: 138, Issue: 1, Pages: 1-29, Publisher: Springer Berlin Heidelberg

[A novel experimental method and computational micromechanical model for in-situ damage detection and prediction of stiffness degradation in cross-ply FML](#)

Authors: **Rahmatollah Ghajar, Mehrdad Ghadami**
Publication date: 1/2/2023
Journal: Composite Structures
Volume: 305, Pages: 116492, Publisher: Elsevier

[A multi-scale aqueous dispersion coating technique for manufacturing carbon fiber reinforced PEEK composite](#)

Authors: **V Balakumaran, Ramasamy Alagirusamy, Dinesh Kalyanasundaram**
Publication date: 1/2/2023
Journal: Composites Part A: Applied Science and Manufacturing
Volume: 165, Pages: 107314, Publisher: Elsevier

[The effect of thermal and cryogenic environments on the impact performance of aluminum-glass fibers/epoxy laminated composites](#)

Authors: **Mohammad Askari, Mehrdad Javadi, Reza Eslami-Farsani, Abdolreza Geranmayeh**
Publication date: 3/7/2023

Journal: Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science
<https://doi.org/10.1177/09544062231159485>, Publisher: SAGE Publications

[Fire Resistance Evaluation of Concrete Beams and Slabs Incorporating Natural Fiber-Reinforced Polymers](#)

Authors: **Venkatesh Kodur, Svetha Venkatachari Pratik Bhatt Vasant A. Matsagar, Shamsheer Bahadur Singh**
Publication date: 2/2/2023

Journal: Polymers
Vol: 15, Issue: 3, Pages: 755, Publisher: MDPI

Recent Publications

[Investigating the impact of different machinability processes and fibre architecture on the bearing performance of pin-loaded textile structural composites for automotive ...](#)

Authors: **Sandeep Olhan, Sameer Kumar Behera, Vikas Khatkar, BK Behera**
Publication date: 27/1/2023

Journal: Journal of Manufacturing Processes
Volume: 86, Pages: 30-55, Publisher: Elsevier
[Comparative analysis of aluminium core honeycomb with 3D woven Kevlar honeycomb composite](#)

Authors: **Lekhani Tripathi, Bijoya Kumar Behera**
Publication date: 23/2/2023

Journal: Materials Science and Technology
Pages: 1-12, Publisher: Taylor & Francis
[Processing and performance evaluation of agro wastes reinforced bio-based epoxy hybrid composites](#)

Authors: **Rahul Joshi, Pramendra Kumar Bajpai, Samrat Mukhopadhyay**
Publication date: 1/2/2023

Journal: Proceedings of the Institution of Mechanical Engineers, Part L: Journal of Materials: Design and Applications
Volume: 237, Issue: 2, Pages: 482-499, Publisher: SAGE Publications

[Computation of the homogenized linear elastic response of 2D microcellular re-entrant auxetic honeycombs based on modified strain gradient theory](#)

Authors: **S Mohammad Reza Khalili, SM Akhavan Alavi**
Publication date: 1/2023
Journal: Journal of the Brazilian Society of Mechanical Sciences and Engineering

Volume: 45, Issue: 1, Pages: 19, Publisher: Springer
[Free vibration analysis of rotating functionally graded conical shells reinforced by anisogrid lattice structure](#)

Authors: **Sayed Masih Banijamali, Ali Asghar Jafari**
Publication date: 3/4/2023

Journal: Mechanics Based Design of Structures and Machines
Volume: 51, Issue: 4, Pages: 1881-1903, Publisher: Taylor & Francis

[A generalized model for one dimensional impact response of a heterogeneous layered medium](#)

Authors: **Satyendra Pratap Singh, Harpreet Singh, Puneet Mahajan**
Publication date: 1/3/2023

Journal: International Journal of Impact Engineering
Volume: 173, Pages: 104433, Publisher: Pergamon



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Recent Publications

[Asymmetric Vibrations of Functionally Graded Annular Nanoplates under Thermal Environment Using Nonlocal Elasticity Theory with Modified Nonlocal Boundary Conditions](#)

Authors: **Rahul Saini, S Pradyumna**

Publication date: 1/5/2023

Journal: Journal of Engineering Mechanics

Volume: 149, Issue: 5, Pages: 04023022,

Publisher: American Society of Civil Engineers

[Structural instabilities in soft electro-magneto-elastic cylindrical membranes](#)

Authors: **Awantika Mishra, Yadwinder Singh Joshan, Sajan Kumar Wahi, Sushma Santapuri**

Publication date: 1/5/2023

Journal: International Journal of Non-Linear Mechanics

Volume: 151, Pages: 104368, Publisher: Pergamon

[Efficient time-domain spectral element with zigzag kinematics for multilayered strips](#)

Authors: **Mayank Jain, Santosh Kapuria, S Pradyumna**

Publication date: 15/10/2022

Journal: International Journal of Mechanical Sciences

Volume: 232, Pages: 107603, Publisher: Pergamon

[Dynamic modeling of pneumatic braided muscle actuator based on Hill muscle model](#)

Authors: **Saswath Ghosh, Abhishek Kumar Srivastava, Sitikantha Roy**

Publication date: 1/4/2023

Journal: International Journal of Non-Linear Mechanics

Volume: 150, Pages: 104340, Publisher: Pergamon

[A multi-scale aqueous dispersion coating technique for manufacturing carbon fiber reinforced PEEK composite](#)

Authors: **V Balakumaran, Ramasamy Alagirusamy, Dinesh Kalyanasundaram**

Publication date: 1/2/2023

Journal: Composites Part A: Applied Science and Manufacturing

Volume: 165, Pages: 107314, Publisher: Elsevier

[Lightweight biodegradable hybrid composite sandwich panel under three-point bending loads-Experimental and numerical](#)

Authors: **Reza Beigpour, Seyed Mohammad Reza Khalili, Hassan Shokrollahi**

Publication date: 10/11/2022

Journal: Polymer Composites

Volume: 43, Issue: 11, Pages: 8007-8029, Publisher: John Wiley & Sons, Inc.

[Creep behaviour of ozone treated jute fabric/epoxy composites](#)

Authors: **Debarati Bhattacharyya, Vijay Baheti**

Publication date: 17/2/2023

Journal: Journal of Composite Materials

<https://doi.org/10.1177/00219983231158160>, Publisher:

SAGE Publications

Research Laboratory and CoE



Research Lab: Rapid Prototyping Lab (Block-III 152)

Faculty in charge: **Prof. PM Pandey, IIT Delhi**

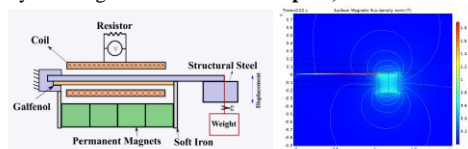
Rapid Prototyping is an institute central facility created in year 2004. The facility is extensively used by students and faculty across the entire institute apart from many individuals and industries out side IIT Delhi. The term rapid prototyping (RP) refers to a class of technologies that can automatically construct physical models from Computer-Aided Design (CAD) data. These "three dimensional printers" allow designers to quickly create tangible physical prototypes of their designs, rather than just two dimensional pictures. Rapid prototyping machine installed at IIT Delhi is based on Selective Laser Sintering (SLS) technology. The process uses polymer powder (polyamide) as a raw material to build artifacts irrespective of their complexity. The prototypes can be made in five different materials namely polyamide, glass-filled polyamide, Alumide (Aluminium mixed polyamide), primecast (wax type of material) and Somos (rubber-like material).

Facilities

EOS P360 Rapid Prototyping Machine from EOS GmbH, Germany, Powder mixer, Powder sieving machine
Shot blasting machine, Magics & Mimics Software

Mechanics of Active Materials and Intelligent Devices Lab (Block-IV 249)

Faculty in-charge: **Dr. Sushma Santapuri, IIT Delhi**



The lab works on smart materials and their applications to sensor and actuator device design. They utilize materials such as magnetorheological elastomers, magnetostrictive materials, dielectric elastomers, flexoelectric materials, etc. One of the main interests of the research team is development of theoretical and computational tools for multiphysics systems. They utilize continuum mechanics-based approach to mathematically model the coupled systems and look at their device response for different geometries and loading characteristics. They have developed membrane, plate and shell theories for these materials and analyzed their output for various applications. They have developed computationally tractable models for coupled and nonlinear systems which are subsequently used towards design of devices such as (i) novel magnetostrictive material based energy harvester; (ii) shear force sensor made of low symmetry piezoelectric materials; (iii) magnetic field responsive artificial muscle actuator.



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Eminent person

Prof. Puneet Mahajan

(Dept. of Applied Mechanics, IITD)



Email: mahajan@am.iitd.ac.in

Webpage: <https://web.iitd.ac.in/~mahajan/>

Professor Puneet Mahajan completed his Ph.D. in 1990 from Montana State University, Bozeman, Montana, and his M.E. in Mechanical Engineering, from Delhi University, in 1985. His B.Sc. in Mechanical Engineering was obtained from Delhi University in 1982. He joined IITD in 1992 and then as an Assistant Professor in 1993 in the Department of Applied Mechanics at the Indian Institute of Technology Delhi (IITD). He was elevated to Associate Professor in 1998 and subsequently became Professor in the year 2005.

Prof. Puneet Mahajan made significant contributions to areas of Finite element methods, Composites and low-velocity impact behavior, snow mechanics, Low and High-velocity impact; Precision glass molding, and Finite Element applications. He has authored over 81 reviewed journal papers, and more than 40 conference proceedings, and has a patent for an Automatic strap mechanism for a motorcycle helmet to his credit. He contributed as PI and consultant to many sponsored projects. **Prof. Puneet Mahajan** has over 3108 citations and has an H-index of 29, as per Google Scholar. His research interests include Composites- Homogenization and mechanical behavior, machining, low and high-velocity impact, Snow Mechanics, Helmet impact and heat transfer, Precision glass moulding, and Applications of Finite Elements.

Eminent person

Prof. Reza Eslami-Farsani

(Faculty of Materials Sc. And Eng., KNTU)



Email: eslami@kntu.ac.ir

Webpage: <https://wp.kntu.ac.ir/eslami/>

Prof. Reza Eslami Farsani completed his Ph.D. in Mechanical Engineering in 2005 from K. N. Toosi University of Technology, Tehran, and his M.Sc. in Materials Engineering, from the University of Tehran, in 1994. He was also awarded Outstanding graduate of the University of Tehran in the M.Sc. He finished his B.Sc. in Materials Engineering from Tehran University in 1990.

Prof. Reza Eslami Farsani has research experiences by contributing the industrial projects which includes the Fabrication and Study of the Behavior of Self-Healing Composites, Fabrication and Study of the Behavior of Fiber Metal Laminates (FMLs), Fabrication and Study of the Behavior of Grid Composites, Fabrication of Silicon Carbide (Particulates & Whiskers) from Rice Husks and Optimization of Its Production, Fabrication of Metal Matrix Composites Based on SiC Reinforced, Feasibility Study for Producing of Glass Fibers, Feasibility Study for Producing of Magnetic Ceramics (Soft and Hard Ferrite), Feasibility Study for Producing of Anti-Acid Bricks, Feasibility Study for Producing of Servomotor. He has authored over 144 international journal papers, 98 conference proceedings, 3 books, 7 chapters book, and 16 patents. **Prof. Reza Eslami Farsani** has over 3469 citations and has an H-index of 31, as per Google Scholar. His research interests include Advanced Fibers, Composites, Nanotechnology (Nanotube & Nanocomposite), and Advanced and Smart Materials. His Honors and Awards include Distinguish Research of Faculty of Materials Science and Engineering, K. N. Toosi University of Technology, Iran (2019 and 2020), 21st Winner in Invention, Khwarazmi International Award - Iran (2008), Distinguish Research of the Islamic Azad University, Iran (2008)



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Promotions and Awards

Prof. Santosh Kapuria,
Dept. of Applied Mechanics



has been selected for
**Prof. P C P Bhat Research
Award for Faculty (Basic
Research Award)**

Prof. Ajeet Kumar, Dept. of
Applied Mechanics



Promoted to Professor

Prof. Sitikantha Roy, Dept.
of Applied Mechanics



Promoted to Professor

Upcoming Conferences

**10th GACM Colloquium on
Computational Mechanics**



Dates: September 10-13, 2023

Location: TU Wien, Vienna

Conference details: The conference is a part of series of events organized by the German Association for Computational Mechanics (GACM). This time, the motto of the conference will be "GACM meets sustainability" and it will take place in Vienna at TU Wien on September 10–13, 2023.

The conference topics will cover all areas of Computational Mechanics. Minisymposium and Abstract submissions are invited on Solid Mechanics, Fluid Mechanics, Computational Methods in Mechanics, Smart Materials, Biomechanics, ML and AI, etc.

**Minisymposia
(MS) submission
deadline:** January 20,
2023

**Confirmation of
Minisymposia:** January 31,
2023

**Abstract
submission open:** February
23, 2023

**Abstract and
poster title
submission
deadline:** March 24,
2023

Conference dates: September
10 - 13,
2023

<https://colloquia.gacm.de/organization>

Honoring the Memory

Prof. Y. Nath, Dept. of
Applied Mechanics, IITD



Prof. R.K. Mittal, Dept. of
Applied Mechanics, IITD



Prof. A. Shokuhfar, Dept. of
Materials Sc. and Eng., KNTU





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Upcoming Conferences

3rd International Conference on Mechanics of Advanced Materials and Structures

9 – 11 August 2023, College Station, Texas, USA

Celebrating Professor J.N. Reddy receiving
the ASME S. P. Timoshenko Medal and the IACM Congress (Gauss-Newton) Medal



Texas A&M Hotel and Conference Center,
Texas A&M University, College Station, Texas

Organized by



J. Mike Walker '66 Department of Mechanical Engineering
Texas A&M University, College Station

<https://cimdm.tamu.edu/events/conferences/icmams2023/>

Upcoming Conference

CALL FOR PAPERS!
Abstract submission is OPEN

Conference Topics:

AREAS:
Material modelling and constitutive relationships
Homogenisation and localisation
Plasticity
Impact and crash
Damage and fracture
Transport phenomena
Fluid-structure interaction
Nanomechanics
Dynamics
Biomechanics
Alternative energy (wind, hydro, solar etc.)
Additive manufacturing, 3D-printing

MATERIALS:
Composites and multiphase materials
Porous and cellular materials
Adhesive science and technology
Advanced materials
Nanomaterials
Biomaterials

METHODS:
Numerical methods
Mathematical foundations
Experimental methods

Date:
3-7 July 2023

Website:
www.acex-conference.com

Contact:
contact@acex-conference.com

Venue:
Aquila Atlantis Hotel | Heraklion | Crete | Greece

**16th INTERNATIONAL CONFERENCE
ON ADVANCED COMPUTATIONAL
ENGINEERING AND EXPERIMENTING**
3-7 July - Heraklion - Crete (Greece)

Contact: contact@acex-conference.com | Website: www.acex-conference.com

www.acex-conference.com

Research Opportunities

1) ASSISTANT PROFESSOR SHIB SHANKAR BANERJEE MATERIAL SCIENCE AND ENGINEERING IIT DELHI

The group is actively looking for highly motivated Ph.D. students and research fellows who would like to work in the research areas highlighted in the webpage. The group is also looking for Postdoc Fellows with fellowship from independent sources like National Postdoctoral fellowship (N-PDF), CSIR, DST, etc. Interested students may contact Dr. Banerjee to discuss research interests and potential projects. For more information, please visit the lab website: <https://sites.google.com/view/shib-shankar/openings>
Contact: ssbanerjee@mse.iitd.ac.in

2) PROFESSOR MALOY KUMAR SINGHA APPLIED MECHANICS IIT DELHI

Three Ph.D. positions are available from 2023. Prof. Singha's group is looking for motivated research students in the area of solid mechanics with a background in civil or aerospace structures, composite structures, etc. For more information, please visit the faculty website: <https://web.iitd.ac.in/~maloy/>
Contact: maloy@am.iitd.ac.in



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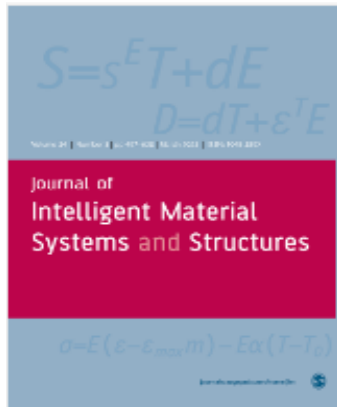
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Journal

Journal of Intelligent Material Systems and Structures



Editorial Board:

Editor-in-chief

Daniel J Innam

University of Michigan, USA

Editor:

N.M.Wereley

University of Maryland, USA

The Journal of Intelligent Materials Systems and Structures is an international peer-reviewed journal that publishes the highest quality original research reporting the results of experimental or theoretical work on any aspect of intelligent materials systems and/or structures research also called smart structure, smart materials, active materials, adaptive structures and adaptive materials. Each submitted article is assigned to an associate editor chosen according to the submitted paper's topic. The associate editor then sends the manuscript to 3 researchers who have expertise in the technical topic of the manuscript. These reviewers' names are not known to the author according to the single blind system. We encourage our reviewers to respond within 6 weeks of submission. This journal is a member of the [Committee on Publication Ethics \(COPE\)](https://wwwCOPE.org/).

Cite score: 5.5 (Scopus),

Impact factor: 2.774(2 years)/2.734(3 years),

Immediacy index: 0.387,

h5 index: 35(Google Scholar)

Google's h5-index is calculated by finding the h-index for articles in a publication over the last five complete calendar years.

Review time: 6 weeks (approximate)

Total citations: 8879 in the JCR year

SCImago Journal Rank (SJR): 0.620

For more information:

<https://journals.sagepub.com/home/JIM>

Journal

Journal of Mechanics



Editorial Board:

Editor-in-chief

K. N. Chiang:

Department of Power Mechanical Engineering,
National Tsing Hua University, Taiwan

Executive Editor:

H.Y. Tsai, Dept. of Power Mechanical
Engineering, National Tsing Hua University,
Taiwan

The Journal of Mechanics publishes original research in all fields of theoretical and applied solid/ fluid mechanics. The Journal aims to serve as an international forum for the exchange of ideas among mechanics communities around the world. The *Journal of Mechanics* especially welcomes papers that are related to recent technological advances, such as micro/nanomechanics, multi-scale computational methods, and design on simulation technology. The contributions, which may be analytical, numerical or semi-empirical, should be of significance to the progress of mechanics. Papers which are primarily illustrations of established principles and procedures will generally not be accepted. Reports that are of technical interest are published as Short articles, and Review articles are published only by invitation. This journal encourages the work related to Mechanical engineering from engineering field, Applied Mathematics from Mathematics and Condensed matter physics from Physics and Astronomy field

Impact factor: 1.455 (as per JCR 2021)

H-Index: 24

Publisher: Cambridge University Press

Country origin: United Kingdom

Cite score, Processing time, Acceptance rate etc. are not available. For more information:

<https://academic.oup.com/jom>



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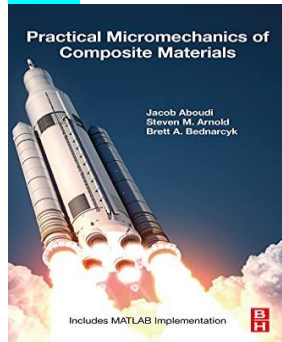
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Book



ISBN: 978-0-12-820637-9

Page count: 400

Published: 2021

Publisher: Butterworth-Heinemann

Language: English

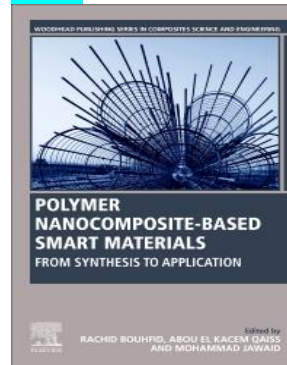
Authors: Jacob Aboudi, Steven Arnold and Brett Bednarczyk

Practical Micromechanics of Composite Materials provides an accessible treatment of micromechanical theories for the analysis and design of multi-phased composites. Written with both students and practitioners in mind and coupled with a fully functional MATLAB code to enable the solution of technologically relevant micromechanics problems, the book features an array of illustrative example problems and exercises highlighting key concepts and integrating the MATLAB code. The MATLAB scripts and functions empower readers to enhance and create new functionality tailored to their needs, and the book and code highly complement one another. The book presents classical lamination theory and then proceeds to describe how to obtain effective anisotropic properties of a unidirectional composite (ply) via micromechanics and multiscale analysis. Calculation of local fields via mechanical and thermal strain concentration tensors is presented in a unified way across several micromechanics theories. The importance of these local fields is demonstrated through the determination of consistent Margins of Safety (MoS) and failure envelopes for thermal and mechanical loading. Finally, micromechanics-based multiscale progressive damage is discussed and implemented in the accompanying MATLAB code.

Contents:

1. Introduction.
2. Lamination theory using macromechanics
3. Closed form micromechanics
4. Failure criteria and margins of safety.
5. The generalized method of cell (GMC) micromechanics.
6. The high-fidelity generalized method of cells (HFGMC) micromechanics theory.
7. Progressive damage and failure

Book



ISBN: 978-0-08-103013-4

Page count: 241

Published: 2020

Publisher: Woodhead Publishing

Language: English

Edited by: Rachid Bouhfid, Abou el Kacem Qaiss and Mohammad Jawaid

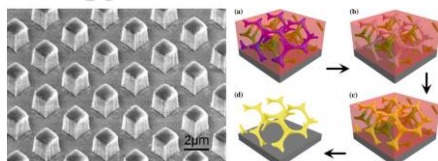
Polymer Nanocomposite-Based Smart Materials: From Synthesis to Application provides a broad, comprehensive review on all major categories of smart materials and their preparation routes. The main application fields and properties for these diverse types of smart polymer-based composite and nanocomposite materials are also discussed. Chapters on modeling methods and simulation look at the physical or chemical change response that is introduced by the effect of changing environmental conditions such as pH, temperature, mechanical force and light. Written by scholars and experts from around the globe, the book covers key aspects, such as synthesis, processing and applications of polymer and nanocomposite-based smart materials.

Contents:

1. Introduction: different types of smart material and their practical applications,
2. Role of characterization techniques in evaluating the material properties of nanoparticle-based polymer materials,
3. Self-healing based on composites and nanocomposites materials: from synthesis to application and modelling,
4. Thermochromic composite materials: synthesis, properties and applications,
5. Piezoelectric polymer films: synthesis, applications, and modelling,
6. Shape memory based on composites and nanocomposites materials: from synthesis to application,
7. Self-assembling smart materials for biomaterials applications,
8. Electroactive polymer composites and applications,
9. Polymer nanocomposites smart materials for energy applications,
10. Smart materials for medical applications,
11. Smart composite materials for civil engineering applications,
12. Molecularly imprinted polymer for water contaminants.

New Branch in Smart and advanced Materials in KNTU

Materionics



According to the public relations report of KN Toosi University of Technology (KNTU), for the first time in the world, a new field called "Materionics Engineering" will be launched at the master's level with the approval of the Ministry of Science, Research and Technology at KNTU. The engineering name "Materionics" is derived from the combination of the names of materials engineering and electronics engineering. "Materionics" engineering field is designed for students who are interested in studying and benefiting from both fields of engineering. Modeled after other interdisciplinary subjects such as mechatronics (combination of mechanical engineering and electronic engineering), "materionics" is a synthesis of overlapping common goals in the fields of materials engineering and electronics. "Materionics" engineering was formed based on the cooperation between the Faculty of Materials Science and Engineering and the Faculty of Electrical Engineering of KNTU.

According to the contents on the website of KNTU, the educational and research program of "Materionics" field with scientific and engineering aspects of structure, properties, production, processing and application of advanced materials in electronic engineering and reciprocally with the aspects of manufacturing electronic devices using materials, it is related to different properties and functions. According to the aforementioned report, the goal of this new field is to train expert researchers and engineers in the field of combining materials engineering and electronic engineering, who with sufficient knowledge of the physical, electronic and mechanical properties of materials, they can play a role in the development of electronic materials and equipment, including electrical, optical and magnetic devices, through manipulation and optimization of the manufacturing method, shape, size, structure and composition of materials.

For more information: [International Journal of Formal Sciences: Current and Future Research Trends \(IJSCFRT\) \(2023\) Volume 17, No 1, pp 1-11](#)

Ph.D. thesis

Creep behaviour of ozone treated jute fabric/epoxy composites

Ms. Debarati Bhattacharyya
 (Department of Textile and Fiber Engineering, IITD) 2020

Supervisors: Prof. Vijay Baheti

Recently, the bio-based textile structural composites gained significant importance in load bearing applications due to rise in environmental concerns and sustainability. The plant fibres have become more popular as reinforcements in composite manufacturing because of their biodegradability, low density, and cheaper cost. Creep is time based progressive deformation under constant applied load. It is undesired phenomena in composites as it leads to instability in loaded structures. The creep behaviour is complex and dependent on the material as well as the environment parameters. The number of chemical treatments (i.e., alkali, acid, bleach, etc.) have been used to improve the plant fibre/matrix interface.

The surface of jute fabrics was modified by ozone gas treatment to remove the non-cellulosic materials and thereby improve their adhesion with epoxy matrix. Further, the performance of ozone surface treatment was compared with traditional alkali treatment based on surface morphology, mechanical properties, hydrophilicity, etc.

The ozone surface treatment was found to remove lignin and increase hydrophilicity of jute fibres to greater extent as compared to alkali treatment, however with higher tendency of defibrillation and fibre rupture. Later, the creep resistance of alkali treated jute fabric/epoxy composites was found superior to the ozone treated jute fabric/epoxy composites at lower temperature of 40°C and 70°C. However, the ozone treated jute fabric/epoxy composites showed higher instantaneous elastic deformation and lower viscous deformation at elevated temperatures of 70°C and 100°C.

The ozone treated jute fabric/epoxy composites showed extended temperature range of 100°C–120°C to restrict segmental mobility of epoxy matrix and depicted higher interfacial shear strength properties from the microbead pull out test.



K. N. Toosi
University of Technology

Ph.D. thesis

Energy Absorption Analysis of Hybrid Metal-Composite Structure Including Cellular Core Using Micromechanical Model based on Laguerre Method

A. Shiravand (Faculty of Mechanical Engineering, KNTU) 2021

Supervisor: **Dr. M. Asghari**

In this thesis, the elastic modulus and energy absorption behavior of cellular structures such as aluminum foams have been investigated. The main purpose of this study is to develop microstructure modeling of cellular structures and to study their elastic-plastic behavior through finite element method. In this research, first a unit cell is prepared to reduce numerical calculations, which has the characteristics of the main foam. The behavior of the unit cell under impact is then simulated and analyzed by the finite element method. Using simulated experiments, a model using the response surface method to obtain the densification strain, elastic modulus, mean plastic stress, yield stress as well as foam compaction behavior will be presented. Finally, the results of FEM and RSM for cellular structures with experimental results is evaluated. The results of this study showed that the possibility of modeling and analysis of energy absorption (impact) of foams is possible using the RSM model presented in this study and finally a suitable structural equation can be achieved to analyze the microstructure of different foams. Also, In this paper, the crushing behavior of hybrid metal-composite conical tube under dynamic loading is studied. An efficient analytical solution for FML conical tubes consist of any number of metal and laminated composite layers is developed. In the analytical analysis, the mean collapse load of structures subjected to axial loading was predicted while its accuracy is validated via experimental tests and numerical simulation. Numerical simulation of the structure is also done using explicit dynamic finite element software in order to investigate the effects of different parameters on crushing characteristics of various structures. On the other hand, new values for failure energies of fiber reinforced composites are proposed in the failure evolution criteria in the finite element model. It leads to good agreement between FE simulations and experimental test other. Moreover, a comprehensive parametric study has been done in order to investigate the effect of various parameters including semi-apical angle, ply pattern of laminated composite, diameter of tube, wall thickness and material properties of tubes on energy absorption capacity and crashworthiness characteristics of various considered specimens. Based on the obtained results the optimized structure is determined.

Ph.D. thesis

Studies on design and development of light weight composites for ballistic protection

Anil Yadav (Department of Mechanical Engineering-IITD) 2020

Supervisor: **Prof. Naresh Bhatnagar**

The use of lightweight protection system by security forces against ballistic threats is one of the important research areas in defence applications. It is very important to provide appropriate protection level with desired mobility for military applications. The high weight drawback of metal based armours directed researchers to explore different types of materials and materials combinations to get lighter armour materials fulfilling similar or better level of protection in armour systems but at lower weight.

In this research work different possibilities of using novel high performance materials were investigated as stand alone body armour for higher protection levels, while also investigating suitable configurations of composites laminates to enhance ballistic strength and reduce back face signature. It was clearly established that a composite light armour consisting of advanced materials with both the high strength/stiffness and high ductility /toughness, if properly configured, can have superior ballistic performance. In order to optimize the processing conditions so as to achieve optimal high strain rate properties, the effect of compression pressure and temperature on high strain rate behavior of composite is also established and the resultant ballistic strength is estimated by using high strain rate behavior using a split Hopkinson Pressure Bar (SHPB) set up. Ballistic test standards, specifications and protocols are largely dependent on the geography since the threat perception, weapons and ammunitions used by the adversaries, environmental conditions and physiology and anatomy of the wearer are different for the different situation, geographies and people. In this research India specific test standards and protocols are proposed with specific focus on permissible back face signature.

This research leads to the development of India standards of body armour and also to novel design of body armour including newer materials and methods under optimized processing conditions.



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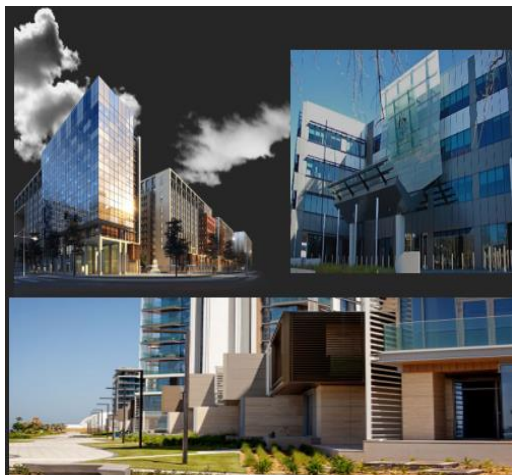
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Company

Reynobond India

Reynobond India is an emerging manufacturer of Aluminum

- Composite Panels (ACP), High Pressure Laminates (HPL) in India.
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Asia Composite, Iran

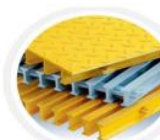
- Asia Composite Company manufacture various kinds of FRP/GRP composite products.
- The main products include FRP/GRP composite standard profiles, specific sections, gratings and cable tray and ladders.



FRP/GRP profile



FRP/GRP Molded Grating



FRP/GRP Pultruded Grating



FRP/GRP cable tray and cable ladder with cover



FRP/GRP Handrail



FRP/GRP Ladder



Manhole cover



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