



K. N. Toosi
University of Technology

Composite & Smart

Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 1



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



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Editorial Message

Impact loading on Composite Structures

In previous editorials, role of light weight material, shape memory alloys and smart composite materials has been highlighted. In this issue, I briefly discuss the role of composites in impact related problems. In a composite matrix is weak and fibre is very strong. In modern aircrafts, composite parts experience impact from debris during landing or when a tool is accidentally dropped during maintenance. In such cases, it is desired that the impact should not cause any breakage or damage even in the matrix of the composites as this could endanger the aircraft. On the other hand, in a bullet proof armour, the aim is to stop the projectile by absorbing its kinetic energy and this is achieved by breaking the strong fibres. So, here are two applications of impact in composites, one where there should be minimal damage in the material and another where the damage should be maximum. Much work in both the above areas of impact using experiments and numerical simulations is being done at IIT Delhi and K. N. Toosi University. Experiments are needed to determine mechanical properties of composites which are used in numerical simulations. This requires determining various moduli, Poisson's ratios and strengths of composites in different directions. Experiments are also needed for validation of numerical simulations. Numerical simulations can be done using commercial Finite Element Packages although sometimes subroutines may have to be written to include special features of composite behaviour.

I take this opportunity to thank Prof. Khalili for his various contributions to promote IIT Delhi- K. N. Toosi University cooperation. Prof. Khalili has recently gone back to Iran after completing successfully his assignment at IIT Delhi. Hope the collaboration in the field of Smart Materials and Composite Structures continues between both the institutes for better innovations and technologies in the near future.

Puneet Mahajan

Professor, Department of Applied Mechanics, IIT Delhi

Contents

You will read in this issue:

1. Editorial Message
2. News on Composites and Smart Materials
3. Recent Publications
4. Student Award
5. Research and Job Opportunities
6. Upcoming Conferences
7. Annual Day of AMS-IITD
8. Eminent Person
9. Book
10. Journal
11. Ph.D. thesis
12. Company

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enews.compsmart@gmail.com

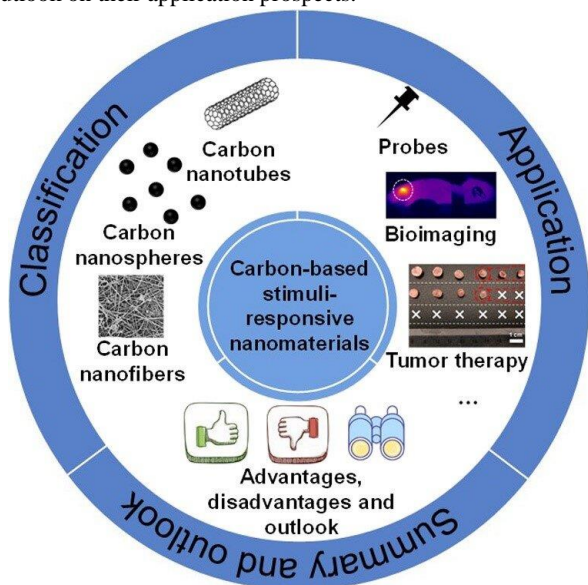


News on Composites and Smart Materials

Carbon-Based Stimuli-Responsive Nanomaterials: Classification and Application

Carbon-based stimuli-responsive nanomaterials are becoming much research oriented due to their versatility, including disease diagnosis and treatment. They work under endogenous (pH, temperature, enzyme, and redox) or exogenous (temperature, light, magnetic field, ultrasound) stimuli. Carbon-based stimuli-responsive nanomaterials can be used as smart materials with dynamically tunable physicochemical properties in response to changes in internal or external environmental stimuli. Their diverse combinations of nanostructures and molecular designs, as well as functional complexes with different carriers, create new opportunities for the development of advanced smart nanomaterials.

A team of researchers reviewed the classification and application of carbon-based stimuli-responsive nanomaterials, based on their microstructures properties, and discusses the applications of carbon-based stimuli-responsive nanomaterials in probes, bioimaging, tumor therapy, and other fields. Finally, they analyze and summarize the advantages and disadvantages of carbon-based stimuli-responsive nanomaterials and provide an outlook on their application prospects.



Classification, application, summary, and outlook of carbon-based stimuli-responsive nanomaterials. Credit: Cyborg and Bionic Systems.

To Know more click on link provided-

Chen Zhao et al, Carbon-Based Stimuli-Responsive Nanomaterials: Classification and Application, *Cyborg and Bionic Systems* (2023). DOI: [10.34133/cbsystems.0022](https://doi.org/10.34133/cbsystems.0022)

Running shoe insoles get a lift with thermoplastic fiberglass tapes

There are typically three layers to the soles of running shoes: a durable exterior outsole, a midsole that takes most of the impact and an insole that has the most direct contact with the foot.

Aiming to make the lightest weight, highest durability athletic shoes available, there have been a number of carbon fiber composite midsoles and other shoe components on the market for years. Generally targeted at elite athletes, these carbon fiber composite-enhanced shoes offer runners top-tier stride and speed increases.

<https://www.compositesworld.com/articles/running-shoe-insoles-get-a-lift-with-thermoplastic-fiberglass-tapes->



Ultra-lightweight skis demonstrate potential of graphene-reinforced composites

skis are made from one of three composite material combinations to meet weight thresholds: a 90/10 fiberglass/carbon fiber blend, a 70/30 fiberglass/carbon fiber blend (slightly lighter weight) and a 100% carbon fiber laminate (lightest weight). The composite laminate sandwiches a structural core made from one of several wood blends designed to produce the desired stiffness, damping and overall performance of the ski. Other materials in the mix include ultrahigh molecular weight polyethylene (UHMWPE) sidewalls, vulcanized rubber, steel outer edges and a nylon blend topsheet with a decorative graphic.

<https://www.compositesworld.com/articles/ultra-lightweight-skis-demonstrate-potential-of-graphene-reinforced-composites>





Composite & Smart

Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 3

Recent Publications

1) Recent developments in the protection of wind turbine blades against leading edge erosion: Materials solutions and predictive modelling

Authors: Leon Mishnaevsky Jr, Antonios Tempelis, Nimesh Kuthe, Puneet Mahajan
Publication date: 2023/6/28
Journal: Renewable Energy
Pages: 118966
Publisher: Pergamon

<https://www.sciencedirect.com/science/article/pii/S0960148123008728>

2) Analysis of a Functionally Graded Finite Wedge Under Antiplane Deformation

Authors: AR Shahani, I Shakeri
Publication date: 2022/9/1
Journal: Journal of Solid Mechanics
Volume: 14, Issue: 3
Pages: 291-311
Publisher: Islamic Azad University-Arak Branch

https://jsm.arak.iau.ir/article_687867.html

3) Vibration analysis and critical speeds of a rotating functionally graded conical shell stiffened with Anisogrid lattice structure based on FSDT

Authors: Seyed Masih Banijamali, Ali Asghar Jafari
Publication date: 2023/7/1
Journal: Thin-Walled Structures
Volume: 188
Pages: 110841
Publisher: Elsevier

<https://www.sciencedirect.com/science/article/abs/pii/S0263823123003191>

4) Synergistic damage mechanics development to predict elastoplastic behavior of an Al/GE laminate with transverse-cracks and plasticity damages

Authors: Rahmatollah Ghajar, Mehrdad Ghadami
Publication date: 2023/8
Journal: Journal of the Brazilian Society of Mechanical Sciences and Engineering
Volume: 45, Issue 8
Pages: 406
Publisher: Springer Berlin Heidelberg

<https://link.springer.com/article/10.1007/s40430-023-04308-5>

5) A modified bond-based peridynamic model without limitations on elastic properties

Authors: Alireza Masoumi, Manouchehr Salehi, Mohammad Ravandi
Publication date: 2023/4
Journal: Engineering Analysis with Boundary Elements
Vol: 149, Pages: 261-281
<https://www.sciencedirect.com/science/article/abs/pii/S0955799723000401>

6) Building a predictive soft armor finite element model combining experiments, simulations, and machine learning

Authors: Tanu Pittie, Kartikeya Kartikeya, Naresh Bhatnagar, NM Anoop Krishnan, Thilak Senthil, Subramaniam D Rajan
Publication date: 2023/4
Journal: Journal of Composite Materials
Vol: 5, Issue: 9
Pages: 1599-1615
Publisher: SAGE Publications

<https://journals.sagepub.com/doi/abs/10.1177/00219983231160497>

7) 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: 2023/5
Journal: Journal of Engineering Mechanics
Volume: 149, Issue: 5
Pages: 04023022
Publisher: American Society of Civil Engineers

<https://ascelibrary.org/doi/abs/10.1061/JENMDT.EMENG-7016>

8) A flexoelectric actuator model with shear-lag and peel stress effects

Authors: Suraj Kumar Rout, Santosh Kapuria
Publication date: 2023/5
Journal: Proceedings of the Royal Society A
Vol: 479, Issue: 2273, Pages: 20230099
Publisher: The Royal Society

<https://royalsocietypublishing.org/doi/full/10.1098/rspa.2023.0099>

9) Characterization and prediction of hygrothermally aged CFRP adhesive joint subjected to mode II load

Authors: Mohd Tauheed, Naresh V Datla
Publication date: 2023/7
Journal: Composites Part C: Open Access
Volume: 11
Pages: 100357
Publisher: Elsevier

<https://www.sciencedirect.com/science/article/pii/S2666682023000130>

10) 3D printing of maxillofacial prosthesis materials: Challenges and opportunities

Authors: Anish Das, Pratiksha Awasthi, Veena Jain, Shib Shankar Banerjee
Publication date: 2023/5/19
Journal: Bioprinting
Pages: e00282
Publisher: Elsevier
<https://www.sciencedirect.com/science/article/abs/pii/S2405886623000258>



K. N. Toosi
University of Technology

Composite & Smart

Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 4

Research and Job Opportunities

1) Assistant Professor Gaurav Singh

APPLIED MECHANICS, IIT DELHI

Join our team, either as a

1. PhD student

We are a dynamic team involved in trying to address some unresolved fundamental problems of fracture mechanics extending the application to composites and thermo-elasticity. Please drop in an email with your CV if you are highly motivated and meet the minimum eligibility criteria for a PhD in this department (details elsewhere). I would expect you to be somewhat confident about the concepts of Linear Elasticity - [here](#) is one of the many places to learn this.

2. Summer Faculty Research Fellow (SFRF)

If you are a faculty at any recognized institute and do not hold a Ph.D. degree, you are welcome to apply for the Summer Faculty Research Fellow Programme at IIT Delhi (details elsewhere) with me. Please express your interest to work with me when you apply. There is no need to email me separately at any stage.

<https://web.iitd.ac.in/~gsingh/>

2) Professor Sitikantha Roy

Research Position(s) Available in "Wearable" ROBOTICS

We have several positions available in "Soft Wearable Robotics" field. The details of the project can be obtained here. We need people to work on soft wearable robotics. Please get in touch if you have background in mechanics, electrical engineering, design, signal processing or control engineering. Wearability inherently bring robot-body interaction and symbiotic musculoskeletal biomechanics. Multibody dynamics of human body motion analysis.

<http://ird.iitd.ac.in/sites/default/files/jobs/project/IITD-IRD-239-2019.pdf>

<https://sites.google.com/view/sitilab-iitd/>

3) POLYSCIENCE 2023

SEPTEMBER 18-20,2023, LISBON PORTUAL

PolyScience2023 aims to bring together the renowned researchers, scientists and scholars to exchange ideas, to present sophisticated research works and to discuss hot topics in the field and share their experiences on all aspects of Polymer Science and Composite Materials.

<https://www.thescientistt.com/2023/polymer-science-composite-materials>

Student Award

Best Poster Award

"Global Indian Young Scientists Research and Innovations Conference 2023"

On "Natural Fiber-Reinforced Concrete and Polymer Composites: Restoring Indian Construction Practices,"

authored by Kusum Saini and Prof. Dr. Vasant Matsagar. The conference was organized by Global Indian Scientists and Technocrats Forum from May 31 to June 2, 2023, in New Delhi.



ENR/GIYSR/14/GIST ID-69429117
NATURAL FIBER-REINFORCED FOAMED CONCRETE PANELS STRENGTHENED WITH BIO-COMPOSITES FOR SUSTAINABLE INFRASTRUCTURES: RESTORING TRADITIONAL INDIAN CONSTRUCTION PRACTICES

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ABSTRACT

The use of natural fibers has been part of Indian construction for centuries. With advancements in infrastructures and their requirements, the construction industry shifted to using concrete, steel, and synthetic reinforcement. However, these practices have drawbacks with materials, processes, sustainability, and high cost. Therefore, in this study, the emphasis is given to redefining the traditional Indian construction practices by using natural fibers as an alternative to advanced construction materials due to the advantages of reduction in CO₂ emissions, energy consumption, and corrosion. The natural fiber-reinforced foamed concrete (NFRFC) panels can be used for walls, flooring, and roofing systems, which provides thermal insulation to structures, and their lightweight results in ease of handling during construction. However, these panels have low strength as compared to concrete panels reinforced with synthetic fibers, shows necessity of this study.

The main objective of the study is to investigate the performance of NFRFC panels with an additional bio-composite layer under dynamic load.

A finite element (FE) model of the NFRFC panel is developed considering the concrete damage plasticity model subjected to dynamic load. Moreover, the dynamic performance of NFRFC panel with and without an additional bio-composite layer is compared.

The increment in the dynamic performance of NFRFC panel due to additional bio-composite layer is reported. The development of a model of NFRFC panels strengthened with bio-composites to resist the dynamic load for sustainable infrastructure.

Keywords: Bio-composites, foamed concrete panel, natural fiber, strengthening, sustainability

"The goal of science and engineering is to build better mousetraps. The goal of nature is to build better mice."





K. N. Toosi
University of Technology

Materials and Structures

Monthly

eNEWSLETTER

No. 6, June 2023

Page 5

Upcoming Conferences

ICASMCS 2024: 18. International Conference on Applications of Smart Materials and Civil Engineering
December 20-21, 2024 in Dubai, United Arab Emirates



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	November 19, 2024
Conference Dates	December 20-21, 2024

Theme of Conference

Applications of Smart Materials in Civil engineering
Smart nanomaterials in construction industry
Smart materials and structures
Types of smart materials and their applications in civil structures
Transformation mechanism of smart materials
Smart materials analysis models
Applications of smart materials
Seismic rehabilitation of bridges
Smart prestressing with shape memory alloys
Super elasticity-based rehabilitation and post tensioning of bridge structures.

For more information: https://waset.org/applications-of-smart-materials-in-civil-engineering-conference-in-december-2024-in-dubai?utm_source=conferenceindex&utm_medium=referral&utm_campaign=listing

ICSMME 2024: 18. International Conference on Smart Materials and Material Engineering
October 28-29, 2024 in Lisbon, Portugal



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	September 30, 2024
Conference Dates	October 28-29, 2024

Themes of conference

Smart materials
Shape memory alloys
Electro and magnetorheological materials
Piezoelectric, ferroelectric multiferroic piezomagnetic
Electro and magnetostrictive materials
Self-healing materials and multifunctional materials
Applications of smart materials structures and related technologies
Fundamental of smart materials
Smart material system that utilize biomimetic and bioinspiration
Smart materials utilized as sensors and actuators with applications at any scale
Trends and development in composite materials
Phase boundaries and boundary layer of phase boundaries.

For more information: https://waset.org/smart-materials-and-material-engineering-conference-in-october-2024-in-lisbon?utm_source=conferenceindex&utm_medium=referral&utm_campaign=listing



K. N. Toosi
University of Technology

Composite & Smart Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 6

Upcoming Conferences

Mechcomp9

9th International Conference on Mechanics of Composites

Porto, Portugal, 26-28 June 2024



Welcome to Mechcomp9, the 9th International Conference on Mechanics of Composites, following very successful first 8 editions around the world.

It will be held at the Faculty of Engineering of the University of Porto, Portugal, from 26-28 June 2024. Deadline for submitting abstracts = 31 January 2024, details on submission soon.

Discount fees until 28 February 2024 = 450 euro for online participation (zoom) and 650 euro for onsite participation (poster or oral presentations). After 28 February 2024, such fees increase by 200 euro each. Please register and pay your registration fees here:

<https://www.congressospcp.abreu.pt/mechcomp9-40067.aspx>

On Occasion of Annual Day

Applied Mechanics Society, IITD, 11 May 2023



3rd International Symposium on Characterization (ISC'23), Istanbul, Turkey

3rd International Symposium on Characterization (ISC'23) is organized by academics and researchers belonging to different scientific areas of the [University of Afyon Kocatepe](#), [University of Giresun](#), [NED University of Engineering and Technology](#), [K. N. Toosi University of Technology](#), [Sabanci University Nanotechnology Research and Application Center \(SUNUM\)](#) and [TUBITAK Marmara Research Center](#).

This event has the objective of creating an international forum for academics, researchers and scientists from worldwide to discuss worldwide results and proposals regarding the soundest issues related to Applied Life Sciences, Medical, Chemistry, Earth and Environmental Sciences, Engineering, Materials Science and Physics. It fosters sound scientific discovery to solve practical problems. The papers will be published in the Abstract E-book of the Symposium. Those papers considered of having enough quality can be further considered for publication in Journal of Characterization. At the authors' choice, those works will be published in the Extended Proceedings E-book of the Symposium. The Symposium will also have a space for companies and/or institutions to present their products, services, innovations and research results. If you or your company is interested in participating in this exhibition as sponsor, please contact the Secretariat here.

Finally, on behalf of the Organizing Committee, I would like to invite all the Scientific Community to participate in this project, presenting papers or communications related to any of the proposed topics. Participants are discounted by 50% in Registration Fee, through K. N. Toosi University of Technology



<https://en.kntu.ac.ir/events/3rd-international-symposium-on-characterization-isc23/>



Composite & Smart

Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 7

Eminent person

Professor Ali Asghar Jafari



Email: ajafari@kntu.ac.ir

Website: <http://sahand.kntu.ac.ir/~ajafari/>

Professor Ali-Asghar Jafari is an esteemed professional in Mechanical Engineering, holding a Ph.D. in Mechanical Engineering from the University of Wollongong, Australia. Prior to his Ph.D., he completed a Master's Degree in Mechanical Engineering at Tarbiat Modares University, followed by a Bachelor's Degree in Mechanical Engineering from Sharif University of Technology. With an academic rank of Associate Professor, Professor Ali-Asghar Jafari's research interests encompass dynamics and vibrations, sheets and shells, and car-related studies, particularly focused on Modal Analysis. His teaching and research expertise lies in Applicable Design.

Throughout his career, Professor Ali-Asghar Jafari has held prominent positions, including Head of the Faculty of Mechanics at Khawaja Nasiruddin Toosi University and serving as Finance-administrative Vice-Chancellor of the same faculty. Additionally, he has made valuable contributions as a Research Assistant within the Faculty of Mechanics. Professor Ali-Asghar Jafari's notable achievements extend to his role as Vice-Chancellor of Monitoring and Evaluation at the Applied Scientific University and his involvement as a Cultural Student Vice-Chancellor at Applied Scientific University.

Professor Ali-Asghar Jafari's research contributions are substantial, with 5 doctoral theses and 50 Master's theses successfully guided under his mentorship, showcasing his commitment to academic guidance. His work has gained recognition through the acceptance of 25 articles in prestigious domestic and international scientific journals, in addition to presenting 50 articles at reputable scientific conferences worldwide.

Furthermore, Professor Ali-Asghar Jafari is an accomplished author, having authored books on car suspension, steering systems, and industrial drawing. His expertise and dedication firmly establish him as a highly regarded professional in the field of Mechanical Engineering.

Professor B.P. Patel



Email: bppatel@am.iitd.ac.in

Website: <https://web.iitd.ac.in/~bppatel/>

Professor B.P. Patel holds a Ph.D. in Applied Mechanics, which he earned in 2005 from the Motilal Nehru National Institute of Technology in Allahabad, completed his Master of Technology (M.Tech.) degree in Mechanical Engineering with a specialization in Design Engineering from the Indian Institute of Technology Bombay (IIT Bombay) in 1999 and his Bachelor of Engineering (B.E.) degree in Mechanical Engineering in 1992 from A. P. S. University in Rewa, Madhya Pradesh. With these academic achievements, Professor B.P. Patel demonstrates a comprehensive understanding of Mechanical Engineering principles, with expertise in Design Engineering and Applied Mechanics.

Professor B.P. Patel has built a successful career in academia and research, with a progressive trajectory. He started as a Scientist 'B' at the Defence Institute of Advanced Technology in Pune from September 1994 to June 1997. Subsequently, from July 1997 to June 2001, he held the position of Scientist 'C' at the same institute. He then served as a Scientist 'D' from July 2001 to December 2004, further expanding his expertise. In December 2004, he joined the Indian Institute of Technology Delhi as an Assistant Professor and continued in that role until August 2008. From August 2008 to June 2014, Patel excelled as an Associate Professor at the Indian Institute of Technology Delhi. Currently, since June 2014, he holds the esteemed position of Professor at the same institute. His diverse experience in both research and academia contributes to his reputation as a highly accomplished professional in his field.

Professor B.P. Patel specializes in several areas, including the Finite Element Method, Mechanics of Composites, Static/Dynamic Buckling Analyses of Beams/Plates/Shells, Higher-Order Shear Deformation Theories, Smart Structures, Fluid-Structure Interactions, Rotating Structures, Thermo-Structural Analysis, and Experimental Stress Analysis. Currently, his research focuses on a range of topics, such as the nonlinear dynamic analysis of shells, thermo-mechanical buckling/postbuckling of shells, dynamic analysis of bimodulus laminated plates/shells, linear/nonlinear analysis of rotating shells, nonlinear flutter of shells, analysis of functionally graded shells, smart structures, and damage mechanics.

Professor B.P. Patel has made significant contributions to their field of expertise. His research has garnered 2564 citations, indicating that other researchers have widely referenced and acknowledged his work. He has achieved an h-index of 29.

Professor B.P. Patel has received several prestigious awards and recognitions throughout his career. In 2001, he was honored with the Young Engineer Award by the Indian National Academy of Engineering, New Delhi. In 2000, he was awarded the Shri Ashok Chaturvedi Memorial Prize and the Shri P. M. Natu Memorial Prize for being the most outstanding student of M.Tech. (Mechanical Engineering) at IIT Bombay. In 1994, he also achieved the Sir J. C. Bose award for standing first in the order of merit in MEFC-4 at IAT.



K. N. Toosi
University of Technology

Materials and Structures

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eNEWSLETTER

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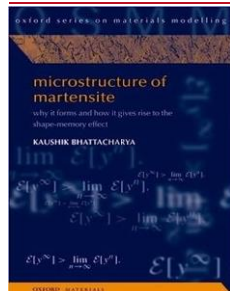
Page 8

Book

Why It Forms and How It Gives Rise to the Shape-Memory Effect

Author: Kaushik Bhattacharya

Oxford Series on Materials Modelling



Publisher: OUP Oxford
(6 November 2003)
Language: English
Hardcover: 300 pages
ISBN-10: 0198509340
ISBN-13: 978-0198509349

Martensites are crystalline solids that display dazzling patterns at the microscopic scales. This microstructure gives rise to unusual macroscopic properties like the shape-memory effect. Starting with the crystalline structure, this book describes a theoretical framework for studying martensites and uses the theory to explain why these materials form microstructure. The macroscopic consequences of the microstructure are subsequently discussed. Complete with a piece of shape-memory wire and numerous examples from real materials, this book represents a successful case study in multiscale modelling, giving a clear understanding of the link between microstructure and macroscopic properties. Beautifully written, in a most clear and pedagogical manner, it holds appeal for a broad audience. On the one hand, it introduces modern modelling techniques to those trained in materials science, mechanics and physics, and shows how these techniques can be used in real-world problems. On the other hand, it introduces physical phenomena to those trained in mathematics, and demonstrates how such phenomena give rise to interesting mathematical problems.

Table of Contents:

1. Introduction
2. Review of Continuum Mechanics
3. Continuum Theory of Crystalline Solids
4. Martensitic Phase Transformation
5. Twinning in Martensite
6. Origin of Microstructure
7. Special Microstructures
8. Analysis of Microstructure
9. The Shape-Memory Effect
10. Thin Films
11. Geometrically Linear Theory
12. Piece-wise Linear Elasticity
13. Polycrystals

Handbook of Smart Materials, Technologies, and Devices

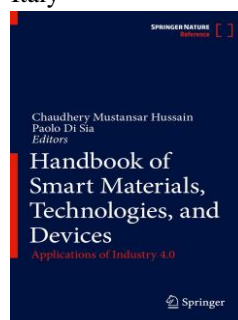
Applications of Industry 4.0

Editors: Chaudhery Mustansar Hussain

Department of Chemistry and Environmental Science, New Jersey Institute of Technology, Newark, USA

Paolo Di Sia

School of Science, University of Padova, Padova, Italy



ISBN: 978-3-030-84204-8,

Published: 2022

Publisher: Springer Cham

<https://doi.org/10.1007/978-3-030-84205-5>

This handbook brings together technical expertise, conceptual background, applications, and societal aspects of Industry 4.0: the evolution of automation and data exchange in fabrication technologies, materials processing, and device manufacturing at both experimental and theoretical model scales. The book assembles all the aspects of Industry 4.0, starting from the emergence of the concept to the consequences of its progression. Drawing on expert contributors from around the world, the volume details the technologies that sparked the fourth revolution and illustrates their characteristics, potential, and methods of use in the industrial and societal domains. In addition, important topics such as ethics, privacy and security are considered in a reality where all data is shared and saved remotely. The collection of contribution serves a very broad audience working in the fields of science and engineering, chemical engineering, materials science, nanotechnology, energy, environment, green chemistry, sustainability, electrical and electronic engineering, solid-state physics, surface science, aerosol technology, chemistry, colloid science, device engineering, and computer technology. This handbook ideal reference libraries in universities and industrial institutions, government and independent institutes, individual research groups and scientists.



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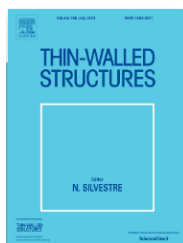
Monthly

eNEWSLETTER

Page 9

Journal

Thin-walled structure



Editorial Board:

Editor in chief

N. Silvestre, PhD

University of Lisbon, Lisboa, Portugal

Thin-walled structures comprise an important and growing proportion of engineering construction with areas of application becoming increasingly diverse, ranging from aircraft, automotive, bridges, ships, oil rigs to storage vessels, industrial buildings and warehouses. Many factors, including cost and weight economy, new materials and processes and the growth of powerful methods of analysis have contributed to this growth, and led to the need for a journal which concentrates specifically on structures in which problems arise due to the thinness of the walls. This field includes cold-formed sections, plate and shell structures, reinforced plastics structures and aluminium structures, and is of importance in many branches of engineering. The primary criterion for consideration of papers in Thin-Walled Structures is that they must be concerned with thin-walled structures or the basic problems inherent in thin-walled structures. Provided this criterion is satisfied no restriction is placed on the type of construction, material or field of application. Papers on theory, experiment, design, etc., are published and it is expected that many papers will contain aspects of all three.

Cite score: 9,

Impact factor: 6.4

Review time: 7.4 weeks

Publication time: 9.5 weeks

Acceptance rate: 33%

For more information:

<https://www.sciencedirect.com/journal/thin-walled-structures/about/insights>

Frontiers in Materials

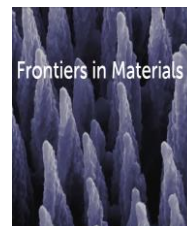
Editorial Board:

Field chief editor

Nicola Maria Pugno

University of Trento

Trento, Italy



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Composite & Smart



Materials and Structures

No. 6, June 2023

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eNEWSLETTER

Page 10

Ph.D. thesis

Processing and performance properties of polypropylene sisal fibre composites and their foams

AJIT BABARAO BHAGAT (PhD 2023)

**Department of Materials Science & Engineering
Supervisor: Prof. Anup Kumar Ghosh, Prof. Bhabani Kumar Satapathy (Department of Materials Sci. & Engg., IIT Delhi)**

This work explores the processability and foamability of Polypropylene/sisal fibre (PP/SF) composites having near critical fibre length and short fibres. The addition of near critical fibre length is expected to cause the rheological percolation which is not possible in short fibre composites. Sisal fibres were treated with sodium bicarbonate (NaHCO_3) for different time intervals and the optimization of the treatment time was done by analysing fibre roughness, crystallinity and tenacity. Specifically, the effect of fibre treatment, fibre length, and addition of compatibilizer (polypropylene grafted maleic anhydride) on the performance properties of the composites were studied. The critical fibre length for the PP/SF composite system was found to be 8 mm. PP/SF composites were prepared using an internal mixer by varying fibre concentration (10, 20, 30, 40 wt.%), and the average fibre length (~17 mm) in the composites confirms the presence of near-critical fibre length. The investigation of the performance of PP/SF composites having near-critical fibre length was carried out using physicomechanical, thermal, rheological, and dynamic mechanical parameters. With increase in fibre concentration, significant improvements in mechanical and thermal properties were observed. The results show that sisal fibre has an undeniable impact on the dynamic mechanical properties of the prepared composites as the storage modulus and loss modulus increase with increase in sisal fibre concentration. However, marginal improvement in the mechanical properties were observed in case of PP/SF composites with short fibres. The marginal improvement in the properties might be due to the short length of fibres, which is unable to transfer load from fibre to matrix.

Study of mechanical behavior of self-healing polymeric nanocomposite structures based on microcapsule

H. EbrahimNejad, Ph.D. 2020

Supervisor: Prof. R. Eslami Farsani

**Materials Science and Engineering Department,
K.N. Toosi University of Technology**

The self-healing composites are a kind of smart materials, which have capability to heal microcracks into themselves. In this research work, the mechanical behavior of smart glass fibers-epoxy self-healing structure containing silica nanoparticles and microcapsules (including diluted epoxy by ethyl acetate) was investigated. Firstly, the microcapsules with urea-formaldehyde shell and urea-formaldehyde/ silica nanoparticles composite shell were synthesized by one stage polymerization method. In the following, the composite containing various weight percentage of microcapsules (7, 14 and 21) and 2 wt.% NiCl_2 .imidazole catalyst was fabricated. In order to investigate the healing behavior, the initial damage was created by quasi-static penetration test. After the tensile, flexural and interlaminar shear strength (ILSS) tests, the composite containing 14 wt.% microcapsules was selected as structure with the optimum healing-mechanical properties. In the next step, the composite containing 14 wt.% microcapsules and various percentage of silica nanoparticles into the matrix were fabricated and the healing behavior of them under the flexural, tensile and ILSS tests were investigated. The results showed that the maximum healing efficiency in the tensile (64.2%) was obtained by adding 3 wt.% silica nanoparticles, whereas in the flexural (110.7%) and ILSS (118.2%) tests were obtained by adding 5 wt.% silica nanoparticles. The phenomena of stick-slip, by nanoparticles, filling the voids by healing agent, the effect of silica nanoparticles of the flowing ability of healing agent and the agglomeration of silica nanoparticles and microcapsules were the influence factors on the healing-mechanical behavior of this kind of composites. In the next step, the silica nanoparticles with various weight percentage (1, 2 and 3) were embedded into the healing agent. The obtained results showed that adding 1wt.% silica nanoparticles had maximum influence on the healing efficiency improvement which was due to formation of nanocomposite s healing shell. In the final step, the mechanical-healing behavior of composites containing 14 wt.% microcapsules with the urea-formaldehyde/ silica nanoparticles composite shell were investigated. The obtained results illustrated that adding 3 wt.% silica nanoparticles had maximum effect on the recovery of tensile, flexural and ILSS tests with the healing efficiency of 79.6, 83.4 and 122.4 %, respectively. The core content of microcapsules, shell thickness of that, formation of sub-microcapsules and microcapsule clusters were the influence factors in the composites containing microcapsules with nanocomposite shell.



Composite & Smart

Materials and Structures

No. 6, June 2023

Monthly

eNEWSLETTER

Page 11

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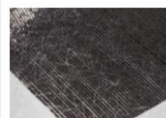
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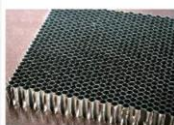
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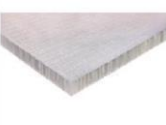
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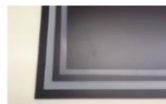
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