



K. N. Toosi  
University of Technology

# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 1

		<b>Editors:</b> <b>Prof. SMR Khalili (KNTU)</b> <b>Prof. S Kapuria (IITD)</b> <b>Prof. S Santapuri (IITD)</b> <b>Editorial Board:</b> <b>DR. H Latifi (KNTU)</b> Mrs. Hossienizadeh (KNTU) Mrs Sahebi (KNTU) Vagish Kumar (IITD-AM) Ravi Kant kumar (IITD-AM) Debjyoti Roy Chowdhury (IITD-CE) Vipin Soni (IITD-AM) Vinay Singh (IITD-AM) Jigiasu Kumar (IITD-ME) Abhijit Suresh Sahare (IITD-AM) Monde Amrutha (IITD-AM) Hela Ambati (IITD-AM) Bhavesh Kumar Jha (IITD-AM) Rahul Sirwani (IITD-TFE) Souvik Jana (IITD-AM) Kusum Saini (IITD-CE) Rohit Sankrityayan (IITD-ME) Prashant Gaurav (IITD-AM)
Editorial board		Please share this newsletter to your friends

## Editorial Message

We are happy to report the inauguration of lightweight structures laboratory in Applied Mechanics Department.

Nowadays, many industries are involved with weight reduction as a key factor in the design and development of materials and components. Therefore, one of the technologies is employment of Lightweight structures for this purpose. However, these structures present challenges: they need to be light but also safe, durable and easy to maintain. How can this be done? There is a triangle which its apexes show interaction between various processes, namely, the interaction between shape design, base material and manufacturing. The evidence gained from both successes and failures demonstrates that the interaction between these three elements is crucial for successful designs and end products.

Design principles of lightweight structures; durability and fatigue; testing; manufacturing methods and mechanics with composites and smart materials are of significance. Therefore, in the new world with high-tech and dynamicity, the engineers and managers in industries and those involved with design process should practice the lightweight structures, absolutely lightweight!

**Prof. SMR Khalili**

Visiting Professor, Department of Applied Mechanics, IIT Delhi

## Contents

You will read in this issue:

1. Editorial Message
2. New application of composite Materials
3. Recent Publication of Faculties and Students
4. Breaking News
5. Research Laboratory and CoE
6. NAFED Meet
7. Upcoming Conference
8. Research Opportunities
9. News on student group project in KNTU
10. Eminent Person
11. Journal
12. Book
13. Interview
13. Ph.D. thesis
15. Company

In case of any suggestions, comments and forwarding news, please E-mail to:

[enews.compsmart@gmail.com](mailto:enews.compsmart@gmail.com)





K. N. Toosi  
University of Technology

# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 2

## News on Composites and Smart Materials

### *Bipolar Polymer Membrane for Green-Hydrogen Production*

Using a double-membrane system and electricity, scientists from Stanford University, the US Department of Energy's SLAC National Accelerator Laboratory, the University of Oregon, and Manchester Metropolitan University in the UK have discovered a method to draw hydrogen from the ocean. Their ground-breaking approach succeeded in manufacturing hydrogen gas without creating a significant amount of toxic by-products. Fresh or desalinated water is a common starting point for attempts to produce hydrogen gas, but those processes may be costly and energy-intensive. The researchers developed a bipolar polymer membrane system to operate with seawater that provides access to the conditions required to produce hydrogen gas and aids in preventing chloride from entering the reaction centre.

<https://www.materialstoday.com/energy/news/membranes-all-at-sea-for-hydrogen-production/>



### *Wearable Shape-Changing Textiles*

How we interact with the garments we wear daily might be altered by a revolutionary advancement in wearable technology. In a recent study, the Design of Active Materials and Structures Lab (DAMSL) and Wearable Technology Lab (WTL) at the University of Minnesota describe the creation of a temperature-responsive textile that may be used to make self-fitting clothing that is solely driven by body heat. Recent publication of the work in *Advanced Materials Technologies* was spearheaded by graduate students Kevin Eschen and Rachael Granberry as well as professors Julianna Abel and Brad Holschuh. The fabrics resemble conventional knits, but they were made with a unique class of active substances called shape memory alloys, which change shape when heated.

<https://phys.org/news/2019-10-shape-changing-textiles-powered-body.html>



Rachael Granberry et al, Functionally Graded Knitted Actuators with NiTi-Based Shape Memory Alloys for Topographically Self-Fitting Wearables, *Advanced Materials Technologies* (2019). DOI: <https://doi.org/10.1002/admt.201900548>

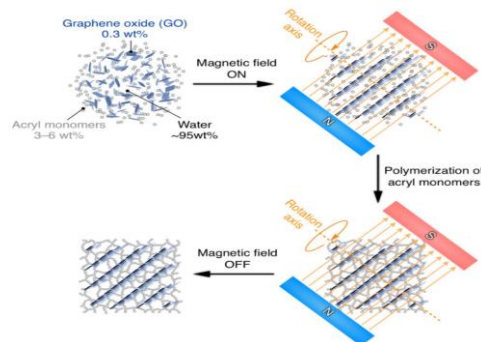
## News on Composites and Smart Materials

### *Composite Materials to Channel Mechanical Energy in a Preferred Direction*

Researchers Develop a material, based on nanofillers embedded in a hydrogel, that can channel mechanical energy in one direction but not the other, acting in a "nonreciprocal" way.

The team was able to use vibrational up-and-down movements to make liquid droplets rise within a material against gravity. Using this material could it possible to make use of random vibrations and move matter in a preferred direction. The group used a hydrogel—a soft material made mainly of water and a polyacrylamide network—and embedded graphene oxide nanofillers into it at a tilted angle. The hydrogel is fixed to the floor, so that the top part can move when subjected to a shear force but not the bottom. The fillers are set at a tilted angle, so that they angle clockwise from top to bottom.

When a shear force is applied from right to left into the leaning nanofillers, they tend to buckle and hence lose their resistance. But if the force is from the other direction, and the nanofillers are facing away from it, the applied shear merely makes them stretch even longer, and they maintain their strength. This allows the sheet to deform in one direction but not the other. The group measured this difference, finding that the material was approximately 60 times as resistant in one direction than the other.



**Schematic illustration for the preparation of the composite hydrogel with unidirectionally aligned GO nanosheets.**

**To Know more click on link provided-** Xiang Wang et al, Mechanical non-reciprocity in a uniform composite material, *Science* (2023). DOI: [10.1126/science.adf1206](https://doi.org/10.1126/science.adf1206). [www.science.org/doi/10.1126/science.adf1206](https://www.science.org/doi/10.1126/science.adf1206)

Bohan Sun et al, A mechanically one-way material, *Science* (2023). DOI: [10.1126/science.adh3098](https://doi.org/10.1126/science.adh3098)



### Recent Publications

**1) Post-repair residual stresses and microstructural defects in wind turbine blades: Computational modelling**

Authors: Daniel Paul, Ayush Varshney, Puneet

Mahajan, Leon Mishnaevsky Jr

Publication date: 2023/4/1

Journal: International Journal of Adhesion and Adhesives

Volume: 123

Pages: 103356

Publisher: Elsevier

<https://www.sciencedirect.com/science/article/pii/S0143749623000350>

**2) Improved mechanical properties of multi-layered PTFE composites through hybridisation**

Authors: Aswani Kumar Bandaru, Ashraf Nawaz Khan, Tayfun Durmaz, Ramasamy Alagirusamy, Ronan M O'Higgins

Publication date: 2023/4/17

Journal: Construction and Building Materials

Volume: 374

Pages: 130921

Publisher: Elsevier

[https://scholar.google.com/citations?view\\_op=view\\_citation&hl=en&user=aVE\\_JXYAAAAJ&cstart=100&pagesize=100&citation\\_for\\_view=aVE\\_JXYAAAAJ:6bLC7aUMtPcC](https://scholar.google.com/citations?view_op=view_citation&hl=en&user=aVE_JXYAAAAJ&cstart=100&pagesize=100&citation_for_view=aVE_JXYAAAAJ:6bLC7aUMtPcC)

**3) Flexural Performance of Basalt Fiber-Reinforced Polymer Prestressed Concrete Beams**

Authors: Ali Alraie, Vasant Matsagar

Publication date: 2023/1

Journal: American Concrete Institute (ACI) Structural

Volume: 120

Issue: 1

Pages: 187-202

Publisher: American Concrete Institute (ACI)

<https://www.proquest.com/openview/2b0cf3f10b19d7dfc193acd72456699b/1?pq-origsite=gscholar&cbl=36963>

**4) 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: 2023/5/1

Journal: Journal of Engineering Mechanics

Volume: 149

Issue: 5

Pages: 04023022

Publisher: American Society of Civil Engineers

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

### Recent Publications

**5) Textile fabrics and ferrite-loaded composite materials for electromagnetic-shielding applications**

Authors: J Krishnasamy, Apurba Das, R Alagirusamy, G Thilagavathi

Publication date: 2023/1/1

Book: Functional and Technical Textiles

Pages: 313-332

Publisher: Woodhead Publishing

**6) Novel high-performance textile fibre-reinforced aluminum matrix structural composites fabricated by FSP**

Authors: Sandeep Olhan, Vikas Khatkar, BK Behera

Publication date: 2023/3/1

Journal: Materials Science and Engineering: B

Volume: 289

Pages: 116265

Publisher: Elsevier

[https://scholar.google.co.in/citations?view\\_op=view\\_citation&hl=en&user=ZkSfR-wAAAAJ&cstart=100&pagesize=100&citation\\_for\\_view=ZkSfR-wAAAAJ:ubry08Y2EpUC](https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=ZkSfR-wAAAAJ&cstart=100&pagesize=100&citation_for_view=ZkSfR-wAAAAJ:ubry08Y2EpUC)

**7) Creep behaviour of ozone treated jute fabric/epoxy composites filled with ozonized and pulverized corn husk particles**

Authors: Debarati Bhattacharyya, Vijay Baheti

Publication date: 2023/2/15

Journal: Materials Chemistry and Physics

Volume: 296

Pages: 127258

Publisher: Elsevier

[https://scholar.google.co.in/citations?view\\_op=view\\_citation&hl=en&user=EdGXqJwAAAAJ&cstart=20&pagesize=80&citation\\_for\\_view=EdGXqJwAAAAJ:8AbLer7MMksC](https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=EdGXqJwAAAAJ&cstart=20&pagesize=80&citation_for_view=EdGXqJwAAAAJ:8AbLer7MMksC)

**8) Processing and performance evaluation of agro wastes reinforced bio-based epoxy hybrid composites**

Authors: Rahul Joshi, Pramendra Kumar Bajpai, Samrat Mukhopadhyay

Publication date: 2023/2

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

[https://scholar.google.co.in/citations?view\\_op=view\\_citation&hl=en&user=XAZrA-AAAAAJ&cstart=20&pagesize=80&citation\\_for\\_view=XAZrA-AAAAAJ:URolC5Kub84C](https://scholar.google.co.in/citations?view_op=view_citation&hl=en&user=XAZrA-AAAAAJ&cstart=20&pagesize=80&citation_for_view=XAZrA-AAAAAJ:URolC5Kub84C)





K. N. Toosi  
University of Technology

# Composite & Smart

## *Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 4

### Recent Publications

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

Authors: Mohd Tauheed, Naresh V Datla

Publication date: 2023/4/2

Journal: Composites Part C: Open Access

Pages: 100357

Publisher: Elsevier

<https://www.sciencedirect.com/science/article/pii/S266682023000130>

#### 10) Mechanical Energy Harvesting and Self-Powered Electronic Applications of Textile-Based Piezoelectric Nanogenerators: A Systematic Review

Authors: Satyaranjan Bairagi, Mohammad Shahadat, Daniel M Mulvihill, Wazed Ali

Publication date: 2023/4/4

Source: Nano Energy

Pages: 108414

Publisher: Elsevier

<https://www.sciencedirect.com/science/article/pii/S2211285523002513>

#### 11) Dynamic behavior of heterogeneous neo-Hookean/Mooney-Rivlin plates reinforced nonuniformly by hyperelastic inclusions: Proposing the correct micromechanical model

Authors: Mohammad Shariyat, Hamed Khani Arani

Publication date: 2023/4

Journal: Journal of Vibration and Control

Volume: 29

Issue: 7-8

Pages: 1626-1643

Publisher: SAGE Publications

<https://journals.sagepub.com/doi/full/10.1177/10775463211067300>

### Breaking News

**A forum for Composite Structures and Smart Materials jointly proposed by IIT Delhi and KNTU was approved by the Department of Applied Mechanics at IITD and Faculty of Mechanical Engineering at KNTU.**

Formation of a scientific forum in the field of composite structures and smart materials has been approved by officials at IIT Delhi and KN Toosi University. This initiative is intended to improve communication amongst the scientists working in this field. Information related to latest research achievements, recent publications, possible joint proposals and joint supervision of students can be publicized.

More information will be shared in upcoming issues

### Research Laboratory and CoE

#### Lightweight Structures Laboratory

(Applied Mechanics Dept.)

Faculty in Charge: Prof. M. Singha

The foundation stone for the IoE funded “*Lightweight Structures Laboratory*” was laid by the Director, IIT Delhi on 24<sup>th</sup> day of April 2024. This capacity building project on lightweight structures was proposed by a team of 17 faculty members with particular emphasis to:

1-Lightweight and strong composites with attention to their ductility, 2-Fatigue, fracture and de-bonding / damage of composites and sandwich panels, 3-Smart material based structural health monitoring and 4- Self-healing lightweight materials and structures.

The purpose is to develop a *state-of-the-art* fabrication and testing facility for lightweight structural members of aerospace, defence, space, energy and automotive sectors.



**The inaugural session of the meet will be held at LH121 from 9:30 am on Sunday 30th April 2023**



# Composite & Smart



K. N. Toosi  
University of Technology

*Materials and Structures*

Monthly

eNEWSLETTER

No. 4, Apr. 2023

Page 5

## Research Laboratory and CoE

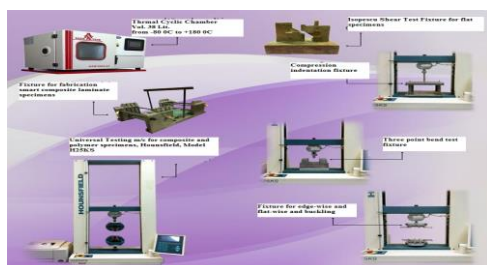
### Centre of Research on Composite and Smart Materials and Structures (CRCSMS)

Faculty of Mechanical Engineering-KNTU, Tehran

Established: 2002

Faculty in charge: Prof. SMR Khalili

The CRCSMS is located in the Faculty of Mechanical Engineering of K. N. Toosi University of Technology, and in the field of analysis, design, manufacturing, processes and different characterization tests on advanced composite and smart materials and structures, as well as their special applications and new research is active. Also, the center is responsible for training students, researchers and industrialists in the field of composite and smart materials and their properties and developing information databases for analysis, design and construction, analytical, numerical and experimental research in the country. The projects done in this center involved Grid composites, Natural fiber composites, Biodegradable composites, Self-healing composites, Smart fiber metal laminate composites, Shape memory reinforced composites, Carbon fiber prosthetic leg, various Smart and Composite sandwich structures, etc.



## Research Laboratory and CoE

### Smart Structures and Dynamic Laboratory

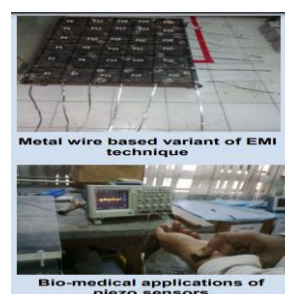
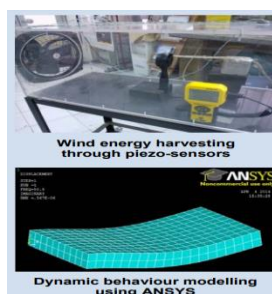
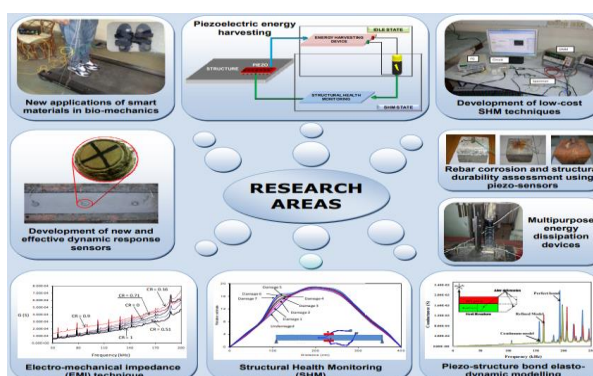
Department of Civil Engineering, IIT Delhi

Faculty in-charge: Prof. Suresh Bhalla

Location: Block-V Room No. 211

Facilities/ Equipment Available:

1. Dynamic Signal acquisition systems, LCR Meters, Oscilloscopes
2. Function Generators
3. Portable dynamic shaker and amplifier
4. Accelerometer and Piezoelectric Ceramic Patches.
5. It also has a Virtual Smart Structures and Dynamics Laboratory.
6. COMSOL Simulations for Piezoelectric Energy Harvesting.







# Composite & Smart

## *Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 6

### Upcoming Conferences

**ICSMCS 2024: 18. International Conference on Smart Materials for Civil Structures**

June 07-08, 2024 in San Francisco, United states



#### 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 06, 2024

Conference Dates June 07-08, 2024

#### Theme of Conference

Smart Structure and Materials, Bioinspiration, Biomimetics, and Bio replication, Electroactive Polymer Actuator and Devices, Active and Passive Smart Structures and Integrated System, Behaviour and Mechanics of Multifunctional Material and composites, Industrial and Commercial Application of Smart Structure Technologies, Nano, Bio, Info-Tech sensors and Systems, Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace System, Smart Sensor Phenomena, Technology, Networks, and System Integration, Non-destructive Characterization for Composite Materials, Aerospace Engineering, Civil infrastructure, Health Monitoring of Structural and Biological Systems

For more information: <https://waset.org/smart-structures-and-materials-conference-in-june-2024-in-san-francisco>

### Upcoming Conference

**ICCEAM 2024: 18. International Conference on Civil Engineering and Applied Mechanics**

May 03-04, 2024 in Singapore, Singapore



#### Important Dates

Abstracts/Full-Text Paper Submission Deadline May 1, 2023

Notification of Acceptance/Rejection May 15, 2023

Final Paper (Camera Ready) Submission & Early Bird Registration Deadline April 02, 2024

Conference Dates May 03-04, 2024

#### Theme of Conference

##### Civil Engineering

Coastal and Harbor Engineering, Computational Methods in Civil Engineering, Construction Engineering and Management, Engineering Materials, Geotechnical Engineering, Hydraulic Engineering, Structural Engineering, Earthquake Engineering, Engineering Seismology, Transportation Engineering, Geomatics Engineering.

##### Applied Mechanics

Aerodynamics, Aeroelasticity, Boundary Layers, Computational Mechanics, Constitutive Modeling of Materials, Dynamics Elasticity, Flow and Fracture, Heat Transfer, Hydraulics, Impact, Internal Flow, Mechanical Properties of Materials, Micromechanics, Plasticity, Stress Analysis, Structures, Thermodynamics, Turbulence, Vibration, Wave Propagation

For more information: <https://waset.org/civil-engineering-and-applied-mechanics-conference-in-may-2024-in-singapore>



# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 7

## Upcoming Conference

### 2nd International Conference on Mechanics of Solids



The full papers (not compulsory) should be sent to the e-mail [lucas@fe.up.pt](mailto:lucas@fe.up.pt) before the 30th of October 2024. The text should be in single column format and double line spacing.

Important dates

17 May 2024 Abstract submission deadline  
31 May 2024 Notification of acceptance to authors  
7 June 2024 Early bird registration

For more information:

<https://web.fe.up.pt/~ms2024/>

## Research opportunities

1) SURESH NEELAKANTAN

ASSOCIATE PROFESSOR

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING, IIT DELHI

The group always looks for motivated PhD students and postdoctoral fellows to join the lab. Please direct your inquiries to [sureshn@iitd.ac.in](mailto:sureshn@iitd.ac.in)

<https://sites.google.com/view/sureshn/the-team>

<https://sites.google.com/view/sureshn/news-and-openings>

2) SANTANU DAS

ASSISTANT PROFESSOR

DEPARTMENT OF CERAMIC ENGINEERING, IIT BHU

The group is looking for Junior Research Fellow (JRF) – project details below.

**Project title:** Metal nanostructure assisted plasmonic hot electron induced phase transformation in 2D-transition metal di-chalcogenides for hydrogen evolution reaction.

<https://iitbhu.ac.in/dept/cer/people/santanudascer>

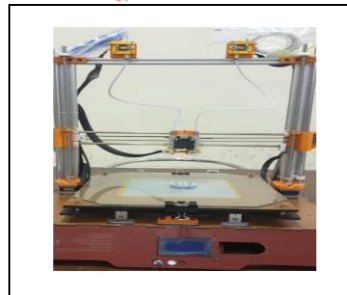
[https://www.iitbhu.ac.in/contents/institute/2023/project/project\\_jrf\\_cer\\_plasmonic.pdf](https://www.iitbhu.ac.in/contents/institute/2023/project/project_jrf_cer_plasmonic.pdf)

## News on student group project in KNTU

**Design and manufacture of FDM 3D printer with two nozzles in K. N. Toosi University of Technology**



**Dr. Mehrdad Kazrooni**



3D printer with two FDM nozzles was made by the researchers of the Faculty of Mechanical Eng. in K. N. Toosi University of Technology. This project has been carried out by the students of the Faculty of Mechanical Eng. of KNTU, under the supervision of Dr. Mehrdad Kazrooni, from the stages of requirements formulation, conceptual design, component design, and module design to construction, final testing, and compilation of production technical knowledge.

This project is completely based on the standard process of engineering design and has the capability of industrial production. The technical knowledge obtained from this project can be used to produce other samples of polymer 3D printers. The design of this product is such that it uses two separate extruders for polymer injection and has the ability to accept two separate GCode programs to produce a 3D part. Also, the movement control system of this device is designed and implemented for a two-nozzle system.

It should be noted that FDM 3D printing is the most common 3D printing technology in the world today. This technology has many applications in rapid prototyping and its devices are widely produced. FDM 3D printing is an additive manufacturing process that belongs to the "extrusion" family. A filament 3D printer or FDM makes a 3D product layer by layer by melting plastic and extruding it.



# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 8

## Eminent person

**Prof. Vasant Matsagar**, (Dept. of Civil Eng., IITD)



Email: [matsagar@civil.iitd.ac.in](mailto:matsagar@civil.iitd.ac.in)

Webpage: <http://web.iitd.ac.in/~matsagar>

Professor Vasant Matsagar completed his Ph.D. in 2005 from IIT Bombay in the area of earthquake engineering. He performed post-doctoral research in the area of application of carbon fiber-reinforced polymer (CFRP) composites in prestressed concrete bridge structures at the Lawrence Technological University (LTU), Michigan in the USA.

He joined the Department of Civil Engineering at the Indian Institute of Technology Delhi (IITD) in the year 2009 as an Assistant Professor. He was elevated to Associate Professor and subsequently became a Full Professor in the year 2018. In addition to this, he is the Editor-in-Chief of the Indian Society of Earthquake Technology (ISET) Journal and the Indian Concrete Journal (ICJ). He is also the Founding Director and Fellow of the Council of Vibration Specialists (CVS) and an elected fellow of the Indian National Academy for Engineering (F-NAE), Coalition for Disaster Resilient Infrastructure (F-CDRI), Institution of Engineers (India) (F-IEI), and Indian Society of Earthquake Technology (F-ISET). Professor Matsagar's current research pursuits have made a significant contribution in the areas of multi-hazard engineering; multi-hazard protection of Structures from Earthquake, Blast, Fire, and Wind; Structures Dynamics and Vibration Control; Finite Element Methods; Fiber-Reinforced Polymer (FRP) Composites in Prestressed Concrete Structures; and Bridge Engineering. He is the faculty in charge of the Multi-Hazard Protective Structures Laboratory (Block IV, 101B, Department of Civil Engineering, IITD).

Professor Matsagar has supervised 12 doctoral theses. Furthermore, he has over 5185 citations and has an H-index of 35, as per Google Scholar. He has authored over 129 journal articles, 22 conference proceedings 19 books. He also holds two patents/applications and one copyright. Thus, enlisting him among the top 2% of scientists in the world.

Professor Matsagar is the recipient of numerous recognitions including the Humboldt Research Fellowship for Experienced Researchers, the Carl Friedrich von Siemens Research Award, the Erasmus Mundus Award, the Erasmus+ Higher Education KA107 Fellowships, FEIT Visiting Academic Fellowship, DST Young Scientist Award, DAAD Research Ambassador and DAAD Awards, DAE Young Scientist Award, IBC Award for Excellence in Built-Environment, IEI Young Engineer Award; IIT Delhi Teaching Excellence Award.

## Eminent person

**Prof. Mohammad Shariyat**, (Faculty of Mechanical Eng., KNTU)



Email: [shariyat@kntu.ac.ir](mailto:shariyat@kntu.ac.ir), [shariyat@gmail.com](mailto:shariyat@gmail.com)

Webpage: <http://wp.kntu.ac.ir/shariyat/>

Professor M. Shariyat completed his B.S., M.S., and Ph.D. in Mechanical Engineering from Tehran Polytechnic University of Technology. He has taught at universities K.N. Toosi University of Technology, Sharif University of Technology, Iranian University of Science and Technology, Tehran Polytechnic University of Technology, Azad University (Central Tehran Branch), and Naval Engineering University. In addition to this, He is the Editor-in-Chief of the Journal of Solid Mechanics and was a member of the Editorial Board of Curved and Layered Structures, Journal of Structural Engineering & Applied Mechanics, Journal of Computational Applied Mechanics, Sharif Journal of Mechanical Engineering, Mechanics of Smart Structures, Journal of Applied, and ISME Journal. He was awarded a fellowship from the Center of Excellence in Smart Structures and Dynamical Systems, and the Center of Excellence for Research in Advanced Materials and Structures. He has a patent on the 'Production of nanostructured copper-based shape memory powder, using the mechanical alloying technique. His awards include Distinguished Professor in Teaching, Noshahr University and Azad (Central Tehran Branch) universities, Distinguished Professor for Research, K.N. Toosi University of Technology, Professors with Highest Numbers of Research Publications 2015, K.N. Toosi University of Technology.

Professor M. Shariyat's current research contributes in the areas of Stress and Vibration Analyses of Beams, Plates, and Shells, Buckling and Post buckling of the Plates and Shells Under Hygro/Thermo/Electro/Magneto/Mechanical loads, Behavior of Composite, FGM, Piezoelectric, Magnetostrictive, Poroelastic, Hyperelastic, Auxetic, and Shape Memory Alloy Structures, Classical and Coupled Theories of Thermoelasticity and Diffusion, Viscoelasticity and Thermo-Visco-Hyper elasticity, Mathematical and Computational Methods in Mechanics, DQM, FEM, BEM, and XFEM Analyses, Vehicle Body Design and Analysis, Vehicle Dynamics and Chassis Systems, NVH Analysis, CAD-CAM & CAE. His research labs include Research Lab for Advanced Automotive Materials and Structures and Research Center for Modern Automotive Systems.

Professor M. Shariyat has supervised 19 doctoral theses. Furthermore, he has over 4806 citations and has an H-index of 40, as per Google Scholar. He has authored over 179 journal articles and 84 International Conference proceedings. He was among the top 1% Scientists of the World (Thomson Reuters Essential Science Indicators ISI-ESI) (2015-2017).





# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 9

## Journal

### Journal of Composites Science and Technology

Supports open access



#### Editorial Board:

Editor-in-Chief

**Marino Quaresimin, PhD**

University of Padova, Italy

*Composite science and Technology*, publishes refereed original articles on the fundamental and applied science of **composites**. The focus of the journal is on **polymeric matrix** composites with reinforcements/fillers ranging from nano- to macro-scale. CSTE encourages manuscripts reporting unique, innovative contributions to the materials science, physics, chemistry and applied mechanics aspects of **advanced composites**. Manuscripts dealing with multi-scale and multi-functional issues and performance as well as interdisciplinary approaches to the study of new generation composite materials are welcome. Analytical work should be validated (either experimental or numerical). Experimental work should include a modelling section (numerical, analytical) suitable to clarify and justify the results presented. The journal attracts papers on modelling of materials (at different scale, from nano to macro - not composite structures).

**Gold open access:** Articles are freely available to both subscribers and the wider public with permitted reuse. An open access publication fee is payable by authors or their research funder.

**Subscription:** Articles are made available to subscribers as well as developing countries and patient groups through our access programs.

**Cite score:** 14.7, **Impact factor:** 9.879

**Review time:** 4.7 weeks

**Publication time:** 0.8 weeks

**Acceptance rate:** 15%

For more information visit:

<https://www.sciencedirect.com/journal/composites-science-and-technology>

## Journal

### Journal of Composite Materials



Published in association with American Society for Composites

#### Editorial Board:

Editor-in-Chief

**Mark Spearing**

Southampton University, UK

*Journal of Composite Materials*, is one of the leading journals of advanced composite materials technology and is ranked number nine by the ISI Journal Citation Report by impact factor for materials science, composites. Now issued 30 times a year, the journal publishes fully refereed original research papers from internationally renowned composite materials specialists from industry, universities and research organizations, featuring new advances in materials, design, analysis, testing, performance and applications. Issues of the *Journal of Composite Materials* collectively provide an encyclopedic resource on all aspects of composite materials science and engineering. Major areas covered include, Analysis · Bonding, CAD/CAM, Ceramic-matrix composites, Coatings, Damage mechanics, Design of materials and components, Environmental effects Metal-matrix composites, Modelling, Non-destructive evaluation, Polymer-matrix composites, Processing and manufacturing, Properties and performance, Prototyping reinforcement materials, Repair, Testing, Thermoplastic composites

**Impact factor(2yrs/5 yrs.):** 3.191/2.859

**Immediacy index:** 0.594

**Article influence score:** 0.389

**Cite score:** 4.7

**SCImago Journal Rank(SJR):** 0.575

For more information visit:

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



K. N. Toosi  
University of Technology

# Composite & Smart

## *Materials and Structures*

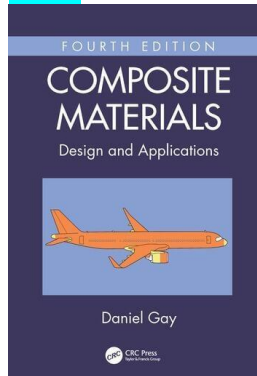
No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 10

### Book



#### **Composite Materials Design and Applications**

**Edited By:** Daniel Gay

**Edition:** 4<sup>th</sup> Edition

**Published:** 2022

**Pub. Location:** Boca Raton

**Imprint:** CRC Press

**DOI:** <https://doi.org/10.1201/9781003195788>

**Pages:** 640

**eBook ISBN** 9781003195788

For decades, *Composite Materials: Design and Applications* has guided readers on the efficient design of structural composite parts and has illustrated challenges encountered in modern engineering practice. The Fourth Edition of this perennial best-seller, now including a foreword by Professor Stephen Tsai, retains its pedagogical structure, featuring a technical level that rises in difficulty as the text progresses, while allowing each part to be explored independently, but has been updated to mirror recent advances and developments in manufacturing processes and applications.

Table of Content:

PART 1: PRINCIPLES OF CONSTRUCTION.

PART 2: MECHANICAL BEHAVIOR OF LAMINATED MATERIALS.

PART 3: JUSTIFICATIONS, D-D LAMINATES, COMPOSITE BEAMS, AND TRANSVERSE SHEAR BEHAVIOR OF MULTILAYERED PLATES.

PART 4: APPLICATIONS.

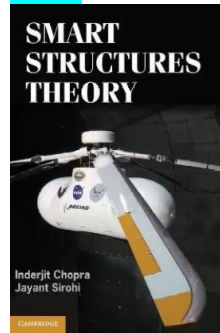
Appendix A: Stresses in the Plies of a Carbon/Epoxy Quadrangle Symmetric Laminate Loaded in Its Plane.

Appendix B: Buckling of Orthotropic Structures

This book serves as a textbook for advanced students studying composite materials design, as well as a handy reference for industry professionals working with composite materials.

<https://www.taylorfrancis.com/books/mono/10.1201/9781003195788/composite-materials-daniel-gay>

### Book



#### **Smart Structures Theory**

**Edited by:** Inderjit Chopra, University of Maryland, College Park, Jayant Sirohi, University of Texas, Austin

**Publisher:** Cambridge University Press

**Online publication date:** December 2013

**Print publication year:** 2013

**Online ISBN:** 9781139025164

**DOI:** <https://doi.org/10.1017/CBO9781139025164>

**Subjects:** Engineering, Aerospace Engineering, Thermal-Fluids Engineering, Civil and Geotechnical Engineering  
**Series:** Cambridge Aerospace Series (35)

The twenty-first century might be called the “Multifunctional Materials Age.” The inspiration for multifunctional materials comes from nature, and therefore these are often referred to as bio-inspired materials. Bio-inspired materials encompass smart materials and structures, multifunctional materials, and nano-structured materials. This is a dawn of revolutionary materials that may provide a “quantum jump” in performance and multi-capability. This book focuses on smart materials, structures, and systems, which are also referred to as intelligent, adaptive, active, sensory, and metamorphic. The purpose of these materials from the perspective of smart systems is their ability to minimize life-cycle cost and/or expand the performance envelope. The ultimate goal is to develop biologically inspired multifunctional materials with the capability to adapt their structural characteristics (stiffness, damping, viscosity, etc.) as required, monitor their health condition, perform self-diagnosis and self-repair, morph their shape, and undergo significant controlled motion over a wide range of operating conditions.

Table of Content:

1 - Historical Developments and Potential Applications: Smart Materials and Structures

2 - Piezoelectric Actuators and Sensors

3 - Shape Memory Alloys (SMAs)

4 - Beam Modeling with Induced-Strain Actuation

5 - Plate Modeling with Induced-Strain Actuation

6 - Magnetostrictives and Electrostrictives

7 - Electrorheological and Magnetorheological Fluids

8 - Applications of Active Materials in Integrated Systems

<https://www.cambridge.org/core/books/smart-structures-theory/EAA178BFD89113EA46BD95529272B74B>



# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 11

## **Interview:** Prof. Vasant Matsagar, Department of Civil Engineering, IIT Delhi



**Q1.** Sir, could you please inform us about upcoming Projects or Initiatives that you are excited about? (Teaching and Research), current collaborations (National and International). How did they come about and the goals of your collaborations? Can you also provide us an update on the Ongoing projects in your Multi-Hazard Protective Structures laboratory?

**ANSWER** 1. Matsagar, V. (PI), Sahoo, D.R., Singh, S.B, Barai, S.K.: "Development of Functionally-Graded Hybrid Fiber-Reinforced Polymer Composites for High Strain Rate and Elevated Temperature Aeronautical Applications", Aeronautics Research & Development Board (AR&DB), Defense Research and Development Organization (DRDO), Ministry of Defense (MoD), Government of India; Rs 91.056 Lakh (Indian Rupees Ninety-One Lakh Five-Thousand Six Hundred Only). Awarded and Ongoing.

2. Matsagar, V. (Indian Collaborator), Kodur, V.K.R. (Vajra Adjunct Faculty): "Fire-Resistant Hybrid FRP Systems for Structural Applications using Cellulosic Fibers Derived from Agricultural Waste", Science and Engineering Research Board (SERB), Department of Science and Technology (DST) under the VAJRA (Visiting Advanced Joint Research) Faculty Scheme with a total research grant of Rs 1,15,00,000 (Indian Rupees One Crore Fifteen Lakh Only). Awarded and Ongoing.

3. Matsagar, V. (PI), D'Ayala, D. (PI, UK), Sahoo, D.R., Sebastian, W.: "Stochastic Multi-Hazard Vulnerability Analysis of Bridges with Basalt Fiber-Reinforced Polymer Reinforcements", Multi-Institutional Faculty Interdisciplinary Research Project (M-FIRP), Indian Institute of Technology (IIT) Delhi and University College London (UCL), Rs 10,00,000 (Indian Rupees Ten Lakh Only). Awarded and Ongoing.

4. Matsagar, V.A.: "Natural Fibre-Reinforcement Material for Low-Cost Seismic Base Isolation of Structures", Resistoflex Dynamics Private Limited, NOIDA, India; Rs 10,00,000 (Indian Rupees Ten Lakh Only). Awarded and Ongoing.

**Q2.** You have been recognized with numerous awards and honors for your work. Which of these accomplishments are you most proud of and why?

**ANSWER** My biggest professional achievement, and one that I am most proud of, is being recognized and conferred a fellowship from the Indian National Academy of Engineering (INAE). INAE, as we know, serves as an elite body, promoting the practice of engineering and technology, as well as allied disciplines, with the purpose of solving challenges of national and international importance. It is the most prestigious fellowship, with worldwide significance.

**Q3.** What advice do you have for researchers who are just starting out in their careers? What qualities do you think are important for success in this field?

**ANSWER** My advice for researchers who are just starting out in their careers is to focus on building a strong foundation of knowledge: During their research stint, they should make sure that they have a solid understanding of their field by developing insight into how research is conducted and develop their own visions for a better futuristic result.

In terms of key qualities for success in research, one should always be committed enough to be the best in their research stint. Their interest and capacity to impart various skillsets essential for research as effectively as feasible should be a priority. Furthermore, research may be a time-consuming and difficult procedure. It is critical to be able to endure in the face of fiascos and hardships. As a result, focusing on what type of activities they would engage in throughout their research tenure should also be considered.

**Q4.** You have mentored numerous doctoral scholars. Can you discuss the challenges of mentoring young researchers?

**ANSWER** There are no formal methods of training a scholar, but whatever informal training we do through our interactions with research scholars, we try to train them on how to conduct research and deliver scientific outcomes. This has its challenges, and it also depends on which candidate we are interacting with, their background, and the training they received before joining this journey.

We enjoy working with some of the brightest minds who come to IIT Delhi for their research projects, particularly those with the necessary background and training and who already know how to conduct research and report their findings and outcomes in the form of high-impact research articles. So, if we can identify one such research candidate who already has that expertise and research ability, it will be a very pleasurable experience.





K. N. Toosi  
University of Technology

### Ph.D. thesis

#### **Microstructure based Elastoplastic Behaviour of Porous Materials with Snow as an Example**

Anurag Kumar Singh (2022)

**Supervisor: Prof. Navin Kumar (Department of Mechanical Engg), Prof. Puneet Mahajan (Department of Applied Mechanics)**

Snow is porous material with complex microstructure made of an interconnected network of sintered ice crystals. Therefore, the mechanical behaviour of snow depends upon its density, microstructure and constitutive law of ice. The anisotropy in the microstructure is expressed in terms of second rank fabric tensor that leads to an anisotropic stress-strain relation. Lately, fabric-based relations have successfully estimated the elastic properties of snow. The fabric-strength model has been recently employed to predict the mechanical response of Trabecular bone and validated with the experimental data. Motivated by this, we propose a fabric-based macroscopic elasto-plastic constitutive law for snow, which can be used to study avalanche initiation. The Fabric tensor and density-dependent yield surface with a provision for isotropic hardening/softening are used in this process. Beyond the initial yield, the yield function grows till the strength of the snow is reached and then softens. Since snow exhibits tension and compression behaviour asymmetry, a piece-wise quadratic yield function is used.

Mean Intercept Length based fabric tensor (MIL fabric) is used as a measure of material fabric and is determined from X-ray micro-computed tomographic ( $\mu$ CT) data of various snow samples. The homogenised stress-strain response and effective mechanical properties were determined from 3D  $\mu$ FE model of various snow samples subjected different boundary conditions. These models are constructed from the  $\mu$ CT data of snow samples. The homogenised elastic and strength data along with the fabric data of each snow sample is employed to evaluate unknown parameters of the fabric-based macroscopic elasto-plastic constitutive law. The constant of isotropic hardening/softening function are determined from the homogenised stress-strain and accumulated plastic strain data of snow samples. The fabric based failure surface. Once all the unknowns of the macroscopic constitutive law are known, it has been implemented as FE code (VUMAT) and fabric based stress-strain response

Stress-strain curves needed for determining the equation of the hardening/softening law and other parameters of the proposed macroscopic constitutive law are obtained through micro-Finite Element ( $\mu$ -FE) simulations. The macroscopic constitutive law has been implemented as a user subroutine in a FE code and can predict the snow's multiaxial behavior.

### Ph.D. thesis

#### **Synthesis and characterization of electrochemical performance of titanium-based anodes reinforced with graphene for lithium-ion batteries**

Hamed Agha Mohammadi ((2022

**Supervisor: Prof. R. Eslami Farsani**

**Abstract:** In this research, the effect of graphene on the electrochemical performance of titanium niobium oxide ( $\text{TiNb}_2\text{O}_7/\text{TNO}$ ) as anode materials in Li-ion batteries (LIBs) was evaluated. First, graphene nanosheets were synthesized in different electrolytes including sulfuric acid and nitric acid using the electrochemical exfoliation method. Then, after performing the solvothermal process to synthesize TNO particles, the effect of different calcination conditions on the purity, morphology, and electrochemical performance of TNO was investigated. After determining the optimal calcination conditions, TNO composites with different contents of graphene and functionalized graphene (1, 3, and 5 wt.%) were synthesized using the solvothermal method under optimal calcination conditions and their electrochemical behavior was investigated. Finally, the effect of adding 3 wt.% graphene/carbon nanotube (CNTs) hybrids on the electrochemical properties of TNO was investigated. The results of electrochemical studies of TNO/graphene composites showed that the effectiveness of graphene nanosheets depends on various factors such as the number of layers, functional groups, and their content in the composites. The results showed that the addition of 3 wt.% graphene led to an improvement in TNO capacity at 20C from 25.86 to 52.63 mAh/g. In addition, cyclic tests at 1C showed that the capacity retention of TNO increased from 35% to 55% after 200 cycles due to the addition of 3 wt.% graphene. Although the use of functionalized graphene improved the Li-ion storage capacity of LIBs at low charge/discharge rates, they did not show adequate high-rate performance and cycling stability due to their high number of layers. The presence of CNTs along with graphene in hybrid composites led to an improvement in the rate and cyclic performance of the samples. The results showed that the presence of 1 wt.% graphene and 2 wt.% CNTs in hybrid composites resulted in an increase in capacity at 20C to 74.4 mAh/g and an increase in capacity retention to 70.1% at 1C and after 200 cycles.



# Composite & Smart

*Materials and Structures*

No. 4, Apr. 2023

Monthly

eNEWSLETTER

Page 13

## Company

### Asia Composite

- NIPCO is the leading manufacturer and supplier of composite products in Iran using latest technologies such as: SMC, BMC, GMT, LFT & RTM.
- They produce variety of composite products such as Auto Parts, Electrical Switch Boxes and also Water Tanks

#### Automobile Parts



Tondar 90 Spoiler



Tondar 90 Spoiler



Samand Front Panel

#### Truck Parts



Chapar Truck



Footstep - Chapar Truck



Footstep Mudguard - Chapar Truck

#### Subway Parts



Subway Train Parts



Subway Train Parts



Seat - Subway Train Parts

### Registered Office



No. 24, 15th St.,  
Vozara Ave., Tehran,  
Iran. Postal Code: 15138-13533  
[www.nipco.ir](http://www.nipco.ir)

## Company

### NitPro Composites

- NitPro Composites are specialized in manufacturing carbon fiber products such as rods, tubes, sheets and molded parts.
- With the product development team and in-house manufacturing facility, NitPro also have the capacity to develop customized composite parts.



Carbon Fiber Rods and Tubes



Carbon Fiber Sheets



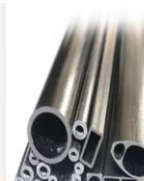
Carbon Fiber CNC Parts



Carbon Fiber Sheets



Carbon Fiber CNC Parts



Carbon Fiber Pultruded Profiles

### Registered Office

**NitPro™**  
COMPOSITES

NitPro Composites

Plot No. 28-29

Noida Special Economic Zone

Noida (UP) 201305 India

[www.nitprocomposites.com](http://www.nitprocomposites.com)