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International Experts Summit on

Mechanical and Mechatronics Engineering

September 11-13, 2023

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About IESMME2023

We are pleased to invite all researchers, young scholars, delegates, experts and students from all over the world to attend the International Experts Summit on Mechanical and Mechatronics Engineering (IESMME2023) will be held in Tokyo, Japan, during September 11-13, 2023.

IESMME2023 provides a platform of international standards where you can discuss and share knowledge on Mechanical and Mechatronics Engineering to bring a unique forum for exchanging the information regarding the latest developments, finding solutions and enriching the knowledge. In addition to Presentations, Workshops, and Discussions, the conference also offers a unique venue for renewing professional relationships, and providing plenty of networking opportunities during the summit.

We're looking forward to Meghaz meetings with researchers from different countries around the globe for sharing innovative and great results in Mechanical and Mechatronics Engineering.

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Abstracts Plenary

The Residential Application of Chain Recooling Energy Recovery Ventilator System in a Hot and Humid Climate

Hwa-Dong Liu[1], Ping-Hsun Shen[2], Wei-Jen Chen[1]

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Abstract

The Energy Recovery Ventilator (ERV) is proven efficient for residential ventilation applications. Yet, certain drawbacks, including a more confined space due to descended ceiling, a lengthy accompanying duct system, and over-ventilation issues that result in extensive energy consumption, need to be addressed. In this study, a novel Chain Recooling Energy Recovery Ventilator (CR-ERV) system is proposed to replace the typical ERV system design to solve the shortcomings above. By conducting an experiment on a three-bedroom condo in a hot and humid climate, it was found that compared to the natural ventilation strategy, the proposed system can help reduce the mean indoor carbon dioxide (CO2) concentration from 976 to 677 ppm and PM2.5 concentration from 6.4 to 4.1 μg/m3, representing a 29% and 34% reduction, respectively. From the regulatory perspective, only 64.4% of the natural-ventilated hours have a CO2 concentration below the 1000 ppm limit per the local air quality Act. This fraction can be improved to 99% after adopting the proposed ventilation system. All these benefits come at the cost of a slight 2.3% increase in electricity consumption. In summary, the proposed system is proven efficient, and its implementation is fairly straightforward and economical; thus might be worth integrating into future residential building projects.

Biography

Wei-Jen Chen has completed his PhD from Texas A&M University. He is a licensed professional engineer with various project experiences. His research expertise includes building automation, building energy management system, building energy simulation, and building physics. Currently he serves as the director of building energy conservation lab at National Taiwan Normal University.

Stereolithographic Additive Manufacturing of Fine Ceramic Components

Soshu Kirihara

Osaka University, Japan

Abstract
In stereolithographic additive manufacturing (STL-AM), 2-D cross sections were created through photo polymerization by UV laser drawing on spread resin paste including nanoparticles, and 3-D models were sterically printed by layer lamination. The lithography system has been developed to obtain bulky ceramic components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust the beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3-D printing, nanometer sized metal and ceramic particles were dispersed into acrylic liquid resins at about 60 % in volume fraction. These materials were mixed and deformed to obtain thixotropic slurry. The resin paste was spread on a glass substrate with 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted to 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was automatically changed for an adequate solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In recent investigations, ultraviolet laser lithographic additive manufacturing (UVL-AM) was newly developed as a direct forming process of fine metal or ceramic components. As an additive manufacturing technique, 2-D cross sections were created through dewaxing and sintering by UV laser drawing, and 3-D components were sterically printed by layer laminations with interlayer joining. Through computer-aided smart manufacturing, design, and evaluation (Smart MADE), practical material components were fabricated to modulate energy and material transfers in potential fields between human societies and natural environments as active contributions to Sustainable Development Goals (SDGs).

Biography
Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics as Sustainable Geoengineering” for environmental modifications and resource circulations, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

Engineering at the Nanoscale: A Strategy for Developing High Performance Functional Materials from Biopolymers

Sabu Thomas

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Abstract

Green chemistry started for the search of benign methods for the development of nanoparticles from nature and their use in the field of antibacterial, antioxidant, and antitumor applications. Bio wastes are eco-friendly starting materials to produce typical nanoparticles with well-defined chemical composition, size, and morphology. Cellulose, starch, chitin and chitosan are the most abundant biopolymers around the world. Cellulose nanoparticles (fibers, crystals and whiskers) can be extracted from agro waste resources. Chitin is the second most abundant biopolymer after cellulose, it is a characteristic component of the cell walls of fungi, the exoskeletons of arthropods and nanoparticles of chitin (fibers, whiskers) can be extracted from shrimp and crab shells. Starch nano particles can be extracted from tapioca and potato wastes. These nanoparticles can be converted into smart and functional biomaterials by functionalization through chemical modifications due to presence of large amount of hydroxyl group on the surface. The preparation of these nanoparticles includes both series of chemical as well as mechanical treatments; crushing, grinding, alkali, bleaching and acid treatments. Since large quantities of bio wastes are produced annually, further utilization of cellulose, starch and chitins as functionalized materials is very much desired. The cellulose, starch and chitin nano particles are currently obtained as aqueous suspensions which are used as reinforcing additives for high performance environment-friendly biodegradable polymer materials. These nanocomposites are being used as biomedical composites for drug/gene delivery, nano scaffolds in tissue engineering and cosmetic orthodontics. The reinforcing effect of these nanoparticles results from the formation of a percolating network based on hydrogen bonding forces. The incorporation of these nano particles in several bio-based polymers have been discussed. The role of nano particle dispersion, distribution, interfacial adhesion and orientation on the properties of the ecofriendly bio nanocomposites have been carefully evaluated.

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Biography

Sabu Thomas is the former Vice-Chancellor of Mahatma Gandhi University, Kottayam, Kerala, India. He is a Professor at the International and Inter University Centre for Nanoscience and Nanotechnology and Full Professor of Polymer Science and Engineering at the School of Chemical Sciences of Mahatma Gandhi University, Kottayam, Kerala, India. His ground-breaking research has covered the areas of polymer science and engineering, polymer nanocomposites, elastomers, polymer blends, interpenetrating polymer networks, polymer membranes, green composites and nanocomposites, nanomedicine and green nanotechnology. Prof. Thomas has received several national and international awards in recognition for his work, and recently received Honoris Causa (DSc) from the University of South Brittany, Lorient, France, in recognition for his contributions to polymer science and engineering. Prof. Thomas has published over 1500 peer- reviewed research papers, reviews and book chapters. He has co-edited more than 210 books. Currently he is having an H index of 137.

New Assessment Approach of Self-consistent Energy System In Highway Service Areas

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2 School of Electronics and Control Engineering, Chang' an University, China

3 Operation Management Center, Transportation Investment Group Co., Ltd, China

Abstract

The large-scale operation of self-consistent energy systems (SCES) in highway service areas reduces the dependence on fossil energy sources, which brings new challenges to the power systems in highway service areas[1]. How to assess the performance of SCES is a key issue. In this paper, based on the resilience and energy efficiency characteristics of different sides, we developed mathematical models of the corresponding sections. Combining the traditional RAMS assessment model with the mathematical models of each side we investigated, we propose a new assessment model[2]. Considering the data characteristics of the self-consistent energy system, we choose the Mixed Analytic Hierarchy Process for data analysis. Simulation results show that the proposed method can describe the actual operation of the system more accurately than the traditional RAMS.

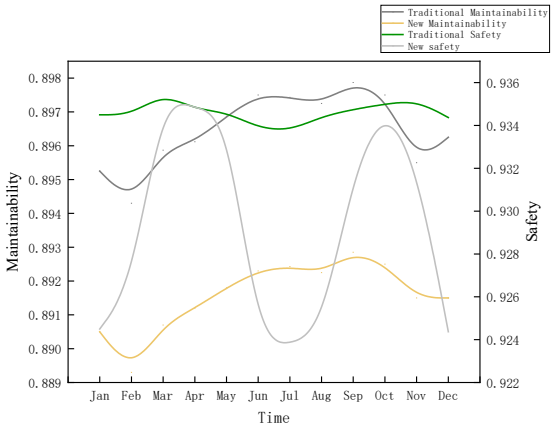

Fig. 1 Comparison of Safety/Maintainability

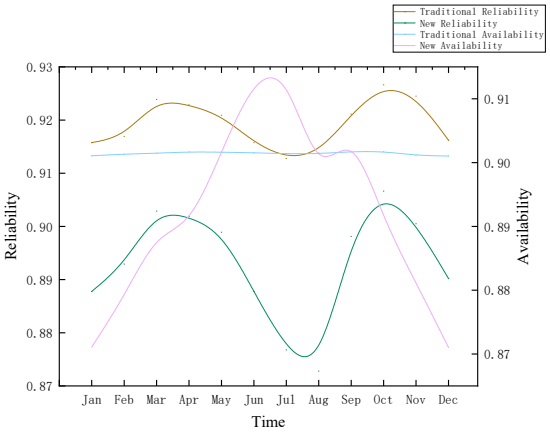

Fig. 2 Comparison of Reliability/Availability

Keywords

RAMS; Resilience; Energy Efficiency; SCES; M-AHP

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Electric Harvesting Circuit of Dielectric Elastomer Generators

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Abstract

Dielectric elastomer generators(DEGs) are used for harvesting electrical energy from mechanical work[1]. When dielectric elastomer(DE) is stretched, charge is drawn from power supply to DE. Charge from the DE is harvested when the DE is relaxed at the high voltage. By transferring charge from a low to high voltage, DEG harvests electrical energy and works as a mechano-capacitive device in essence. The electrodes of the DE were connected to an electrical circuit. The electrical circuit has an larger capacitor and two diodes. The voltage of the large capacitor keeps constant throughout the electromechanical cycles. The diodes only conduct depending on the voltage across the DE. To harvest the electric energy at a constant voltage, the capacitance of the capacitor should be large enough. Simplified electrical circuits and electrical circuits including measuring circuits for energy harvesting are shown as in Fig. 1(a) and Fig. 1(b), respectively.

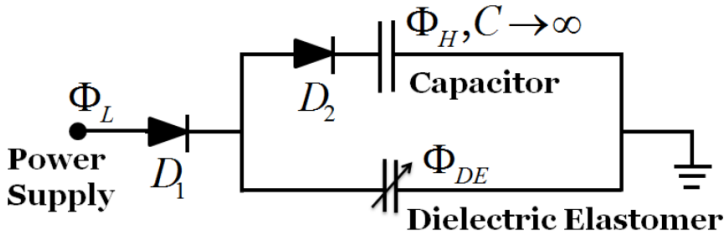

Fig. 1(a) Simplified electrical circuits

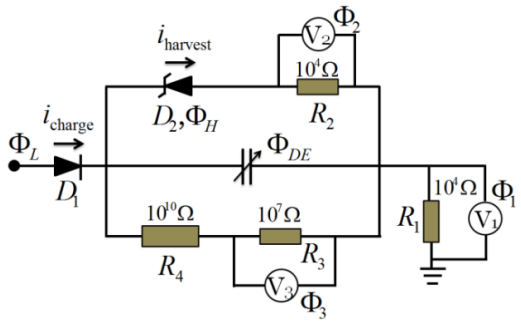

Fig. 1(b) electrical circuits including measuring circuits

Keywords

Dielectric Elastomer Generator, Electromechanical, Energy Harvester

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Biography

Junshuo Chen received the B.S. degree in electrical engineering from Zhengzhou University, Zhengzhou, China, in 2007, and the Ph.D. degree in electrical engineering from Northwestern Polytechnical University, Xi'an, China, in 2014. He is a Lecturer with School of Electronics and Control Engineering, Chang'an University, Xi'an, China.

Effect of Pulsating Jets on Thermo-acoustic Instabilities

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Abstract

Thermo-acoustic instabilities appear in thermal devices when acoustic waves are linked and unsteady heat is emitted. The present work describes the use of steady air jets to suppress these instabilities. To overcome these instabilities, a novel active control mechanism has been created based on the injection of pulsing air jets into a Rijke tube. To regulate thermo-acoustic instability, this novel and compact active control technology eliminates the additional mass of air. A reciprocating setup provides pulsating air jets to the flame in the Rijke tube. The position of the burner was to start from x/L= 0 to x/L = 0.25, where x is the location of the burner in the Rijke tube, while L is the overall length of the Rijke tube. The experimental results demonstrate the influence of pulsating air jets at different speeds on thermo-acoustic instabilities. The suppression was most effective in the frequency range of 27-33 Hz and at a flow rate of 6.8 LPM, and this control strategy successfully controlled the combustion instability of around 35-42 dB. The suggested pulsating air jet technology was shown to be successful in removing the requirement for an external compressor.

Keywords

Thermo-Acoustic Instabilities, Rijke Tube, Active Control, Pulsatile Injection

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From Flexible to Stretchable Pads

W.M. Huang

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Abstract
Pad-like devices are getting more and more popular, since they can be used as the input part for remote control of electronics, including cloud-based system.

In this talk, we report our recent progress in the development of two types of pad-like devices, one is a wearable keypad, which has the interesting and very important feature of comfort fitting of individuals, while the other is stretchable capacitive touchpad. The wearable keypad reported here is meant for fitting the wrist part of any individual and can be easily put on and taken off. The fitting process can be repeated multiple times whenever needed. Two types of stretchable capacitive touchpads based on two different mechanisms, namely, stretchable conductive thread and stretchable conductive textile, have been worked out.

Prototypes of all these types of devices have been fabricated and are presented here to demonstrate their working principles.

Keywords
Touchpad; Keypad; Wearable; Stretchable; Fitting

Biography
Dr Wei Min Huang is currently an Associate Professor (tenured) at the School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore. With over 25 years of experience on various shape memory materials (alloy, polymer, composite and hybrid), he has published over 200 papers in journals, such as Accounts of Chemical Research, Advanced Drug Delivery Reviews, and Materials Today, and has been invited to review manuscripts from over 300 international journals (including Progress in Polymer Science, Nature Communications, Advanced Materials, and Advanced Functional Materials, etc), project proposals from American Chemical Society, Hong Kong Research Grants Council, etc, and book proposals from Springer, Elsevier and CRC. He has published two books (Thin film shape memory alloys – fundamentals and device applications, Polyurethane shape memory polymers) and is currently on the editorial board of over three dozen of journals.

Internet of Things in Smart Grid: Architecture, Applications, Services, Key Technologies, and Challenges

A. Ghasempour

University of Applied Science and Technology, Iran

Abstract
Internet of Things (IoT) is a connection of people and things at any time, in any place, with anyone and anything, using any network and any service. This implies addressing elements such as convergence, content, collections, computing, communications, and connectivity in the context where there is a seamless interconnection between people/humans and things and/or between things. Thus, IoT is a huge dynamic global network infrastructure of Internet-enabled entities with web services. One of the most important applications of IoT is the Smart Grid (SG). SG is a data communications network which is integrated with the power grid to collect and analyze data that are acquired from transmission lines, distribution substations, and consumers. In this presentation, we talk about IoT and SG and their relationship. Some IoT architectures in SG, requirements for using IoT in SG, IoT applications and services in SG, and challenges and future work are discussed.

Keywords
Internet of Things; Smart Grid; Advanced Metering Infrastructure; Distributed Energy Resources; Smart Meters; Meter Data Management System

Biography
Alireza Ghasempour has been a faculty member in the Information and Communications Technology department at the University of Applied Science and Technology for more than 10 years. He has extensive experience in research, teaching, and executive positions. His areas of interest include smart grids, the Internet of Things, machine learning, deep learning, optimization techniques, and wireless heterogeneous networks. He has published two book chapters, and several papers in peer-reviewed journals, IEEE conferences, and international conferences.

Simulation Informed Deep Learning Fault Diagnosis of High-Speed Train Bogie Bearing

Buyao Yang[1], Tiantian Wang[1,2], Jingsong Xie[2]

[1]College of Mechanical and Vehicle Engineering, Hunan University, Changsha, Hunan province, China

[2]School of Traffic and Transportation Engineering, Central South University, Changsha, Hunan province, China

Abstract

Deep learning-based bogie axle-box bearing fault diagnosis methods has made great progress. However, due to the interpretability and data dependence of deep learning training, the reliability of deep learning-based fault diagnosis methods is difficult to meet the application requirements. A novel deep learning network model with simulation information embedding is proposed in this paper. The dynamics model of the bogie gear is established to obtain the key fault feature frequency components. Based on the fault feature information, an optimizable simulation information embedding network layer is constructed to realize the vibration signal weighting guided by the mechanism information, which makes the fault-related features more prominent. Fault classification with weak mechanism coupling is completed by combining the 2D-CNN classifier network. The proposed method is validated using the bogie gear fault dataset and the public gearbox dataset. Compared with other supervised deep learning methods, the proposed method focuses more on fault characteristics, and can maintain high classification accuracy under variable working conditions and strong noise, showing better interpretability and reliability.

Biography

Buyao Yang received the M.Sc dgree in mechanical engineering with Zhengzhou University, Zhengzhou, China. He is currently pursuing the D.E. degree in mechanical engineering with Hunan University, Changsha, China.His current research interests include rotating machine diagnosis, health management of High-speed train bogie and transfer learning.

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Biomedical Engineering in Coronary Artery Stenting

Ramachandran Muthiah

Senior Resident in Medicine, Thoothukudi Medical College, Tamil nadu state, India

Abstract
Technological advancements of coronary stents have progressively revolutionized the treatment of ischemic heart disease over the past 40 years.The process of atherogenesis is beyond the mere accumulation of lipids, as it presents a series of responses characteristic to inflammatory disease .Repeated episodes of ischemia are a potential source of the inflammatory stimulus, and the so-called " inflammatory hypothesis "is now a targeted, therapeutic area in clinical and experimental cardiology. However, coronary artery disease (CAD) could become chronic (arteries narrowing over time) or acute (resulting from a sudden rupture of plaque), necessitating stent-based clinical intervention, to unblock arteries and regulate normal blood flow. A stent forms a tiny wire mesh tube designed to remain permanently implanted at the intended site.

Although bare metal stents (BMS) prevented abrupt occlusion/recoil for reproducible clinical outcomes, the challenge of in-stent restenosis (re-narrowing artery wall after stent implantation) is troublesome. Drug eluting stents (DES) introduced, primarily addressed in-stent restenosis. Nanotechnology during PCI promote healing by inducing endothelialization of the stent and reduce restenosis. Endothelial healing and re-endothelialization may restore the injured vessel. Nano-sized hydroxyapatite coating, carbon nanoparticle coated stents with consistent release of sirolimus, pitavastatin and Magnetic silica nanoparticles with rapamycin exhibit endothelialization in vitro-studies. Liposome encapsulated alendronate (a biphosphonate), an antimitotic drug (paclitaxel) in the form of albumin - based nanoparticles with significant antiproliferative effects can reduce restenosis and neointimal hyperplasia in animal models. An in-depth review of bioresorbable stents and scaffolds deserve a separate entity. Electrospunnanosized fibrous scaffolds, Synthetic alternatives for coronary artery bypass grafts were studied in graft procedures.

Biography
Ramachandran Muthiah, born on 10/5/1966 in a small village at Keezkulam and father (Muthiah) belongs to Enayam Thoppu and mother (Swornam) belongs to Keezhkulam-629193 (Palaninta vilai- landline +91 4651 203014) and both were farmers. Primary school education at Aanan vilai primary school at Keezhkulam and secondary school education at Concordia higher secondary school at Pootteti in Theruvukadai near Karungal in Kanyakumari District in Tamil nadu state of India. Completed MBBS in 1989 under Madurai Kamaraj University in Tirunelveli medical college, M.D. in General Medicine in 1996 under MGR medical university in Tirunelveli medical college, D.M. in cardiology in 2003 at Madurai medical college under Tamil Nadu Dr.MGR Medical University,Chennai and completed 6 months course in Interventional cardiology at Batra Heart centre under National board of examinations, Ministry of health, Govt of India, New Delhi in 2006 . Worked as medical officer in Rural health services (keelachekkarakudi PHC in Thoothukudi District, Arryapapuram PHC in Tirunelveli District and ESI hospital at Singanallur in Coimbatore) for 5 years and in teaching category as Assistant Professor at Madras, Coimbatore, Kanyakumari and Thoothukudi medical colleges and Professor at Dr.SMCSI Mission hospital & Medical college, Karakonam, Trivandrum and Azeezia Medical college, Kollam in Kerala state. Marital status get troubled in 2004 at Coimbatore, career get spoiled thereafter in Tamil nadu as mental hospital transfer & deputations from Madras and Thoothukudi medical colleges and psychiatric custody from Kanyakumari medical college via some irrational men as higher cadre in political sectors and suffered a lot as police arrest, brutal assaults on my head and backbone and jail imprisonment at Balaramapuram, Neyyatinkara from medical trust hospital in kerala state through its police, political, medical and judiciary sectors.. Published many papers in Cardiosource, American College of Cardiology Foundation, Case Reports in Clinical Medicine (SCIRP) and Journal of Saudi Heart Association. Special research on Rheumatic fever and Endomyocardial fibrosis in tropical belts, Myxomas, Ineffective endocarditis, apical hypertrophic cardiomyopathy, Ebstein's anomaly, Rheumatic Taussig-Bing Heart, Costello syndrome and Tetralogy of Fallot.

Probabilistic Design for Reliability Concept Enables Assuring Reliability of Electronics and Photonics Materials, Devices, Packages and Systems

E. Suhir

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Abstract
Role, significance, attributes and challenges of the recently suggested probabilistic-design-for-reliability (PDfR) concept [1-3] in the "physical" (actually, thermo-mechanical) design of electronic and photonic devices, packages and systems are addressed and briefly discussed. The emphasis is on the following major aspects and applications of this concept: 1) PDfR's rationale, significance, role and attributes; 2) PDfR concept extension to the field of ergonomics engineering: human-in-the-loop (HITL) [4], when both equipment reliability and human(s) performance contribute jointly to the outcome of a mission or an extraordinary situation; 3) failure-oriented accelerated-testing (FOAT) [5] at the design stage (suggested to be conducted in addition to FOATs that are more or less routinely carried out at the product development and burn-in testing stages) as the experimental foundation of the PDfR concept, as well as the role of such a design-stage-FOAT vs the popular today highly-accelerated life testing (HALT) [6]; 4) role and significance of the constitutive multi-parametric Boltzmann-Arrhenius-Zhurkov (BAZ)[7] equation as an extension and modification of Boltzmann's, Arrhenius' and Zhurkov's kinetic equations in classical thermodynamics, physical chemistry and experimental fracture mechanics, respectively; 5) application of the PDfR concept to the burn-in testing (BIT) ("to BITor not to BIT, that's the question") [8]; 6) low-temperature/random-vibration bias as a physically meaningful and economically feasible alternative to the popular today temperature cycling-tests (TCTs); 7) possibility to avoid inelastic strains and, hence, low-cycle-fatigue conditions in solder-joint interconnections of IC structures[9]; and 8) the role and significance of and the requirements for analytical ("mathematical") modeling, which is employed in this write-up [10]. It is concluded that predictive modeling should always be considered and conducted prior to and, when possible and appropriate, also during the actual accelerated tests of any kind, and that analytical modeling, preferably of the PDfR type, always complements computer simulations. These two major modeling tools are based on different assumptions and use different calculation techniques, and if the results obtained using these tools are in agreement, then there is a good reason to believe that these results are accurate and, hence, trustworthy.

Keywords
Boltzmann-Arrhenius-Zhurkov (BAZ) Equation; Burn-in-Testing (BIT); Probabilistic design for reliability (PDfR); Failure-Oriented-Accelerated-Testing (FOAT); Highly-Accelerated-Life-Testing (HALT); Temperature-Cycling-Tests (TCT)

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Biography
Dr. Suhir is Life Fellow of the IEEE, the ASME, the SPIE, and the IMAPS, Fellow of the APS, the IoP (UK), and the SPE), and Associate Fellow of the AIAA. He has authored 500+ publications, presented numerous plenary, keynote, invited and contributed talks and taught continued education courses worldwide and received many professional awards, including 2004 ASME Worcester Read Warner Medal, 2019 IEEE EPS Field award and 2022 IEEE SCV Section Outstanding Engineer award.

13 no content abstract

Sliding Behavior at the Graphene Oxide and Polymer Matrix Interface with Different Interfacial Features

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Abstract

With their excellent physical properties, two-dimensional nanostructures are becoming popular reinforcements for polymer nanocomposites. Considering the structural complexity of nanofillers and diverse interfacial connections, in-depth understanding of the strengthen mechanism becomes crucial for the optimum design of nanocomposites. Based on in silico studies, this work explored the interfacial properties between varies graphene oxides (GOs) and polyethylene (PE). It is found that the sliding interface occurs in the adhesive zone (sliding between two phases) or in the cohesive zone (shearing within the PE matrix) depending on the morphology of the GO. Functionalization of GO could tune the low-density interface between GO and PE. Long functional groups enhance the interface friction and shift the interface sliding to cohesive sliding, which enables strong interfacial shear strength comparable with the tensile strength of pure PE. However, higher flexibility of function groups weakens the enhancement effect. Further investigations show that the interfacial shear strength has a strong dependency on the examined sample thickness when it is less than around 30 Å, and reducing the thickness would generally lead to higher interfacial shear strength due to the boundary restriction effect. Overall, this work provides a comprehensive understanding on the strengthening mechanisms at the GO/PE interface with varying GO features, which could be beneficial for the design of high-performance nanocomposites.

Biography

Wei Hanqing has completed her PhD from Beihang University, China and postdoctoral studies from Zhejiang University, China

New Criteria for the Objective Selection of Industrial Robots

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Abstract
When it comes to the task of selecting industrial robots for specific applications, it is important to choose them based on objective criteria or objective performance indicators. This method of selection allows us to find the best robot for the envisaged application. All the new proposed criteria are based on technical and/or experimental data serving a new concept named " efficient quality." This concept shows how far the quality level of a robot must be extended to fulfill a concrete task with the best results. The proposed criteria are organized on three levels: simple indicators, complex indicators, and finally, the global indicator, which represents the mathematical quantification of the efficient quality of the robot. Considering the latest approach in this field, indicators can be ponderated according to the importance of the specific robotized application.

The new proposed objective criteria are very important for engineers, managers, investors, and also for the producers and sellers of industrial robots, offering uncontestable mathematical tools to improve design and production and also to choose the best suitable robot for the designed task.

Biography
Mateas Marius-Cornel has completed his Ph.D. from the Polytechnic University in Timisoara, Romania, in the field of industrial robot performance evaluation. He is presently a lecturer and researcher at the Polytechnic University of Timisoara, Romania, EU. He is a member of the Romanian Society for Industrial Robotics. He has published more than 19 scientific papers in reputed journals and international conference proceedings, has been a researcher in more than 20 research grants and contracts, and has been the author or coauthor of 8 books in the field of mechatronics. In 2010 he became a "Bologna" Professor as a reward for his educational activity.

Dark-State Metasurface Laser with Controllable Radiative Coupling

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Abstract

There exist challenges in lasing at the nanoscale and the need for alternative feedback schemes that rely on resonant near fields of photonic states, rather than free propagating waves. Also, there are limitations of plasmonic nanoparticles and the potential of dark resonant surface modes based on dielectric films to provide low lasing thresholds and controllable emission. I will present a design concept for meta surface lasers that separates the gain-coupled resonant photonic state responsible for macroscopic stimulated emission from the coupling to a specific free-space propagating field optical output.

Smart Structures: From 3D to 4D Printing

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Abstract
With progressive advancements in various cutting-edge technologies, smart structures with both robust stability and manipulatable functions are highly pursued to meet the critical requirements in the various complicated environments. On the other hand, development of addictive manufacturing technology has fundamentally exhibited great advantages, which provides an exclusive platform for manufacturing smart structures. Based on 3D printing added with additional dimension, either time or space, for manipulating shape, property or functions, in the present talk, I would initially analyze the key scientific issues in 4D printing technology, including design, materials, apparatus, software, manipulation and applications. Based on an advanced structure strategy for achieving smartness, I would give several examples based on our current studies for better understanding how 4D printing play a significant role in designing and manufacturing smart structures and smart devices based on the uniqueness of various materials. The 4D printing technology is expected to open up a novel strategy for substantially endowing the advanced structures with smartness and exceptionality.

Biography
Prof. Daining Fang is an academician of Chinese Academy of Sciences and vice-president of the Chinese Society of Theoretical and Applied Mechanics. He has published more than 500 papers in reputed journals and has been serving as an editorial board member in several reputed journals of mechanics and materials science.

Magnetic Properties of the Strong Nuclear Interaction

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Abstract
Subatomic physics deals with the study of the elementary constituents of matter and the interaction between them. Nuclearand elementary particles physics are essentially at the forefront of nowadays understanding of physics. Nucleus is a bound system of strongly interacting protons and neutrons (more generally baryons and mesons - this is the reason for the collective name hadrons) holds atomic nuclei together and, in another context, binds quarks within hadrons. The baryons are bound states of three quarks and mesons are composed of quark and antiquark. It should be add that theforces between the quarks must be long - range, because the gluons (as photons) have zero mass. Traditionally the forces between hadrons are short - range and the residues of the for as between their quark constituents. Unfortunately, modern QuantumChromodynamics (QCD) (the modern theory of strong interaction) does not provide us with the tools to calculate the bound states of the proton (deuteron) from first principles. All leptons and quarks are fermions and therefore have a spinn equal ½ and non – zero magnetic moment.In 1935 Yukawa have tried to develop a theory of nuclear forces. The most important feature of Yukawa"s forces is they have a small range (10-15). There are common place in nuclear and high enery physics that the strong force does not act on leptons (electrons). Our report is devoted tostudy the magnetic properties of thestrong nuclear interaction via measuring the low - temperature (2K) photoluminescence spectra of LiH (Eg = 4.992 eV) (without strong interaction inhydrogen nucleus) and LiD (with strong interaction in deuteerium nucleus) as well as mixed crystals.[1] The uniqueness of LiH and LiD compounds is that they differ in only one neutron, i.e. lithium ions, electron and prooton are the same for them and, therefore they have the same gravitational, weak and electromagnetic interactions. The addition of a neutron to hydrogen nucleus, generates according to Yukawa, a strong interaction between a prooton and a neutron, the which effect in manifested in the isotoope shift (0.103 eV) of the zero – phonon emissioon line of free exciton in LiD crystals. Taking into account the animalously large values of the magnetic moment of neutron the main mechanism of long – range interaction in the isotoope shift is the magnetic interaction of the strong nuclear force. We must emphasize that LiD crystals have a maximum strong coupling constant αs, which according to our estimation is equal 2.4680, as well as neutron – electron binding energy equals 0.105 eV [2].

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Biography
Professor V.G. Plekhanov has graduated Tartu State University (Estonia). He obtained Ph. D (physics and mathematics, 1972) as well as Dr. Sci. (physics and mathematics, 1982) – both degrees from Tartu State University. Main interest field – dynamical and magnetic properties as well as strong nuclear interaction.