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Virtual Event

5th Edition of

ADVANCED MATERIALS SCIENCE WORLD CONGRESS

27-28 MARCH
2023

ADV. MATERIALS SCIENCE 2023

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PROGRAM-AT-A-GLANCE

ADV. MATERIALS SCIENCE

2023

DAY 1
MARCH 27, 2023

Scientific Program

GMT-Greenwich Mean Time

08:30-09:00	**Introduction**

Distinguished Speaker Talks

Sessions: Materials Science and Engineering | Nanomaterials and Nanotechnology | Advanced Materials and Nanotechnology | Smart Materials and Applications | Energy Materials | Polymer Science and Technology | Composite Materials | Carbon and 2D Materials|Graphene Technology | Metamaterials | Perovskites | Metallurgical and Materials Engineering | Metals and Alloys | Optics | Biomaterials and Medical Devices | Surface Science and Engineering

09:00-09:25 Keynote Talk	**Title: Physical development in the early years: The impact of a daily movement programme on young children's physical development** **Pat Preedy,** *LSC Education Ltd, United Kingdom*
09:25-09:50 Keynote Talk	**Title: Graphene coatings: A disruptive approach to durable mitigation of environment-assisted degradation** **Raman Singh,** *Monash University, Australia*
09:50-10:10	**Title: Pickering like emulsion stabilized via fine bubbles** **Tomohiro Onda,** *Kao Corporation, Japan*
10:10-10:30	**Title: Spin reorientation in layered perovskite oxyfluoride $Pb_3Fe_2O_5F_2$** **Kengo Oka,** *Kindai University, Japan*
10:30-10:50	**Title: Analysis of the solidus temperature of multicomponent steel** **Toshio Fujimura,** *JFE Techno Research Corp, Japan*
10:50-11:10	**Title: Integrated hydrobulging of prolate ellipsoids from preforms with multiple thicknesses** **Jian Zhang,** *Jiangsu University of Science and Technology, China*
11:10-11:30	**Title: A modularity design approach to behavioral research with immersive virtual reality: A SkyrimVR based behavioral experimental framework** **Yu-Hsin Chen,** *Wenzhou-Kean University, China*

Refreshment Break 11:30-11:45

11:45-12:05	**Title: Mineral and toxic metal content of tropical stingless bee honey (Apidae; Heterotrigona itama) from Sabah, Borneo** **Suzan Benedick,** *University Malaysia Sabah Sandakan Campus, Malaysia*
12:05-12:25	**Title: Derivation of the high-Tc version of the BCS optical conductivity of conventional superconductors using the spin polaron theory and matsubara green's functions** **Unofre B. Pili,** *University of San Carlos, Philippines*
12:25-12:45	**Title: Diagnostic performance of acoustic radiation force impulse imaging in evaluating liver fibrosis in patients with chronic hepatitis B infection: A cross-sectional study** **Chuong Dinh Nguyen,** *University Medical Center of HCMC, Vietnam*
12:45-13:05	**Title: Mechanical behavior of graphene reinforced metal matrix composites** **G.G.SOZHAMANNAN,** *Sri Manakula Vinayagar Engineering College, India*
13:05-13:25	**Title: Dielectric properties of alumina-$CaTiO_3$ nanocomposite for biomedical application** **Prafulla Kumar Mallik,** *Indira Gandhi Institute of Technology, India*
Lunch Break 13:25-13:55	
13:55-14:15	**Title: Soft artificial optical skin for biomedical application** **Abhijit Chandra Roy,** *Indian Institute of Science, India*
14:15-14:35	**Title: THz graphene MIMO dielectric resonator antenna** **Amarjit Kumar,** *National Institute of Technology, India*
14:35-14:55	**Title: Automatic sleep stage classification with reduced epoch of EEG** **Sagar Santaji,** *KLS Gogte Institute of Technology, India*
14:55-15:15	**Title: Porphyrin: An emerging next generation functional molecule for energy related applications** **Darpan Vijaykumar Bhuse,** *Vellore Institute of Technology, India*
15:15-15:35	**Title: Lead-free transducer design for non-invasive continuous glucose monitoring using photoacoustic spectroscopy** **Pradyut Kumar Sanki,** *SRM University, India*

15:35-15:55	**Title: FTIR spectrum of soil organic carbon changes (SOC) by the growth of rubber tree (Hevea brasiliensis) seedlings in soils with varied pH and base status** **Ambily. K.K,** *Rubber Research Institute of India, Kottayam, India*
15:55-16:15	**Title: Optimization study on sliding wear characteristics and heat treatment conditions of different grades of ferritic ductile cast iron** **Bramaramba.v,** *NIT Rourkela, India*
16:15-16:35	**Title: High Thermal Stability of the RF dielectric properties of the $BiVO_4$ matrix added with ZnO** **Daniel Xavier Gouveia,** *Federal University of Ceará, Brazil*

Refreshment Break 16:35-16:50

16:50-17:10	**Title: Effects of serum albumin on the photophysical characteristics of synthetic and endogenous protoporphyrin IX** **Iouri Borissevitch,** *Universidade de São Paulo, Brazil*
17:10-17:30	**Title: The zygoma anatomy-guided approach (ZAGA) for rehabilitation of the atrophic maxilla** **André Sakima Serrano,** *Private practice at ZAGA Center São Paulo, Brazil*
17:30-17:50	**Title: Nanocellulose biobased composite overlays** **Gregory T. Schueneman,** *Forest Products Laboratory, USA*
17:50-18:15 Keynote Talk	**Title: A single intraarticular injection of nanotechnology-based drug formulation as a safe osteoarthritis disease-modifying drug** **Hee-Jeong Im,** *University of Illinois at Chicago, USA* *& Jesse Brown Veterans Affairs Medical Center, USA*

Panel Discussions

DAY 2

MARCH 28, 2023

Scientific Program

GMT-Greenwich Mean Time

08:30-09:00	**Introduction**

Distinguished Speaker Talks

Sessions: Materials Science and Engineering | Nanomaterials and Nanotechnology | Advanced Materials and Nanotechnology | Smart Materials and Applications | Energy Materials | Polymer Science and Technology | Composite Materials | Carbon and 2D Materials|Graphene Technology | Metamaterials | Perovskites | Metallurgical and Materials Engineering | Metals and Alloys | Optics | Biomaterials and Medical Devices | Surface Science and Engineering

09:00-09:20	**Title: A new type of silica-induced "moundless" pitting corrosion in copper observed in Japan** **Masahiro Sakai,** *Muroran Institute of Technology, Japan*
09:20-09:40	**Title: Antibiotic-resistant superbugs on nanomaterials and nanoplastics** **Sunghee Joo,** *University of Seoul, South Korea*
09:40-10:00	**Title: Investigation on fracture behavior of cementitious composites reinforced with aligned hooked-end steel fibers** **Sujjaid Khan,** *Hebei University of Technology, China*
10:00-10:20	**Title: Classification of fungal diseases in plant based on deep learning techniques** **Mallikarjun Hangarge,** *Karnatak Arts, Science and Commerce College, India*
10:20-10:35	**Title: Tungsten oxide–reduced graphene oxide composites for photoelectrochemical water splitting** **Shahzad Munir Ansari,** *Federal Urdu University of Arts, Science and Technology, Pakistan*
10:35-10:55	**Title: Luminescence studies on Eu^{3+}: B_2O_3-SrO-TiO_2-LiO- Al_2O_3 glasses** **M. Priya,** *Saveetha Engineering College, India*
10:55-11:15	**Title: Chitosan nanoparticles and their application in agriculture** **Divya Koilparambil,** *Apple International School, UAE*

Refreshment Break 11:15-11:30	
11:30-11:50	**Title: Causal analysis of company performance and technology mediation in small and medium enterprises during COVID-19** **Ashraf Mishrif,** *Sultan Qaboos University, Oman*
11:50-12:10	**Title: Domination of pythagorean fuzzy gragh** **Sadegh Banitalebi,** *Imam Hossein University, Iran*
12:10-12:30	**Title: Direct cost analysis for 32,783 samples with preanalytical phase errors** **Pinar Eker,** *Maltepe University Faculty of Medicine, Turkey*
12:30-12:50	**Title: Modelling Strength Data Sets via Modified Weibull Distribution** **Huseyin Unozkan,** *Halic University, Turkey*
12:50-13:10	**Title: Advances in illicit drugs detection at points of care** **Ghadeer M. M. Abdelaal,** *Zagazig University, Egypt*
13:10-13:30	**Title: Analysis of straightness and flatness errors based on Python** **Ahmed M. S. El Melegy,** *National Institute of Standards, Egypt*
Lunch Break 13:30-14:00	
14:00-14:20	**Title: Biological acidification of pig manure using banana peel waste to improve the dissolution of particulate phosphorus: A critical step for maximum phosphorus recovery as struvite** **Langa Bright Moyo,** *University of the Witwatersrand, South Africa*
14:20-14:40	**Title: Robotic process automation in banking industry: A case study on Deutsche Bank** **Alice Saldanha Villar,** *University of Essex, United Kingdom*
14:40-15:00	**Title: A culture model for the assessment of phenylalanine neurotoxicity in phenylketonuria** **Julian Kylies,** *University Medical Center Hamburg-Eppendorf, Germany*
15:00-15:20	**Title: Ethics of human-machine interaction: A proposition** **Abeer Dyoub,** *University of L'Aquila, Italy*

15:20-15:40	**Title: Evaluation of structural properties of biodegradable nanoPMOs by STORM imaging for efficient cancer therapy** **Pradip Das,** *University of Montpellier, France*
15:40-16:00	**Title: The advanced use of Calphad databases and methods in computational thermodynamics** **Bo Sundman,** *OpenCalphad*
16:00-16:20	**Title: Synthesis of chiral-at-metal rhodium complexes from achiral tripodal tetradentate ligands** **Ricardo Rodríguez,** *Universidad de Zaragoza, Spain*

Refreshment Break 16:20-16:35

16:35-16:55	**Title: Quality of life after extraction of mandibular wisdom teeth: A systematic review** **Bassima Chami,** *Mohammed V University, Morocco*
16:55-17:15	**Title: Exploring chitosan as an ecofriendly agent to improve sustainable dyeing properties of cotton fabric dyed with (Opuntia Ficus-Indica L) fruit peel and its UV protection activity** **Rym Mansour,** *University of Monastir, Tunisia*
17:15-17:35	**Title: Coping with complexity in scientific research by combining systems, qualitative and quantitative approaches** **Omar Sacilotto Donaires,** *School of Economics, Business Administration and Accounting at Ribeirão Preto, Brazil*
17:35-18:00 **Keynote Talk**	**Title: Development of B-cell reference materials for comparable and quantitative cytometric expression analysis** **Lili Wang,** *National Institute of Standards and Technology, USA*
18:00-18:25 **Keynote Talk**	**Title: Nanostructured materials templated on short DNA oligonucleotides, at different pH conditions** **Julio Cesar Gonzalez Olvera,** *Universidad Politécnica de Santa Rosa Jáuregui, Mexico*
18:25-18:45	**Title: XRD-Results measured on fracture surfaces of austenitic tensile test specimen** **Karl Berreth,** *Materialprüfungsanstalt Universität Stuttgart, Germany*

Panel Discussions

Closing Remarks

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SCIENTIFIC ABSTRACTS

DAY 1

VIRTUAL EVENT

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Advanced Materials Science World Congress
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BIOGRAPHY

Pat Preedy has had a long and distinguished career in education, which includes being a global Chief Academic Officer for early childhood education, Executive Principal of a school catering for pupils from 3 months to 18 years with boarding, Head Teacher of one of the first Beacon Schools in the UK and a school inspector. He has conducted a range of research including the 'Movement for Learning' and 'Parents as Play Partners' projects. As honorary research consultant for Twins Trust Pat has conducted extensive research into meeting the educational needs of multiple birth children and has developed an online accredited course for teachers with Professor John Mascazine through Ohio Dominican University.

Pat Preedy
LSC Education Ltd, United Kingdom

Physical development in the early years: The impact of a daily movement programme on young children's physical development

Poor physical development in young children has been shown to impact readiness for school, behaviour, social development and academic achievement. This research sought to explore whether a physical intervention programme (Movement for Learning) can improve children's physical development. The Movement Assessment Battery for Children (2nd edition, MABC-2) was used to assess 108 children (aged 4-5) from three schools in the UK at the start and end of the Reception Year (4-5 years). A monitoring and evaluation survey was completed by 37 teachers which highlighted ways in which the programme had impacted children. Univariate ANOVA using change scores showed significant changes in favour of the intervention group who had undertaken the movement programme.

BIOGRAPHY

Raman Singh's expertise includes: Alloy Nano/Microstructure-Corrosion Relationship, Stress Corrosion Cracking (SCC), Corrosion/SCC of Biomaterials, Corrosion Mitigation by Novel Material (e.g., Graphene), Advanced and Environmentally Friendly Coatings, High Temperature Corrosion. His distinctions include: supervision of 50 PhD students, Guest Professorship at ETH Zurich, US Naval Research Lab, Indian Inst of Science and University of Connecticut, Editor of a book on Cracking of Welds (CRC Press), Lead Editor of a book on Non-destructive Evaluation of Corrosion (Wiley), over 260 peer-reviewed international journal publications, 15 book chapters and over 100 reviewed conference publications, Editor-in-chief of an Elsevier and an MDPI journal, Fellow ASM International and Fellow Engineers Australia, over 50 keynote/plenary talks at international conferences (besides numerous invited talks), leadership (as chairperson) of a few international conferences.

Raman Singh
Monash University, Australia

Graphene coatings: A disruptive approach to durable mitigation of environment-assisted degradation

Corrosion and its mitigation costs dearly (any developed economy loses 3-4% of GDP due to corrosion, which translates to ~$300b to annual loss USA). In spite of traditional approaches of corrosion mitigation (e.g., use of corrosion resistance alloys such as stainless steels and coatings), loss of infrastructure due to corrosion continues to be a vexing problem. So, it is technologically as well as commercially attractive to explore disruptive approaches for durable corrosion resistance.

Graphene has triggered unprecedented research excitement for its exceptional characteristics. The most relevant properties of graphene as corrosion resistance barrier are its remarkable chemical inertness, impermeability and toughness, i.e., the requirements of an ideal surface barrier coating for corrosion resistance. However, the extent of corrosion resistance has been found to vary considerably in different studies. The author's group has demonstrated an ultra-thin graphene coating to improve corrosion resistance of copper by two orders of magnitude in an aggressive chloride solution (i.e., similar to sea-water). In contrast, other reports suggest the graphene coating to actually enhance corrosion rate of copper, particularly during extended exposures. Authors group has investigated the reasons for such contrast in corrosion resistance due to graphene coating as reported by different researchers. On the basis of the findings, author's group has succeeded in demonstration of durable corrosion resistance as result of development of suitable graphene coating. The presentation will also assess the challenges in developing corrosion resistant graphene coating on most common engineering alloys, such as mild steel, and present results demonstrating circumvention of these challenges.

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Pickering-like emulsion stabilized via fine bubbles

T. Onda

Kao Corporation, Japan

Micro-nanobubbles exhibit unique properties, such as mass transfer, electroflotation, disinfection, decontamination, bioactivity and cleansing. Among them, we note the cleansing property, in which oil on skin, hair, and cloth can be effectively washed off using water with micro-nanobubbles.

We propose that this cleansing property is due to the Pickering-like emulsification of oil induced by fine bubbles. When air, water, and oil exhibit a three-phase contact angle, bubbles can attach to the interface between the water and oil. In this case, the oil is expected to form an oil-in-water emulsion stabilized via bubbles even without surfactants, similar to a Pickering emulsion stabilized via solid particles. Although the lifetime of the bubble-induced Pickering-like emulsion is limited, this emulsion appears transiently and is expected to enhance the cleansing property of fine bubbles.

To demonstrate this, we theoretically analyzed the interfacial energy of a system comprising a water–oil interface and a single bubble or multiple bubbles. The results indicate that the interfacial energy decreases when a bubble residing in water attaches to the water–oil interface. This predicts that an oil-in-water emulsion, which includes fine bubbles in water, is stabilized by the attachment of bubbles and forms a Pickering-like emulsion.

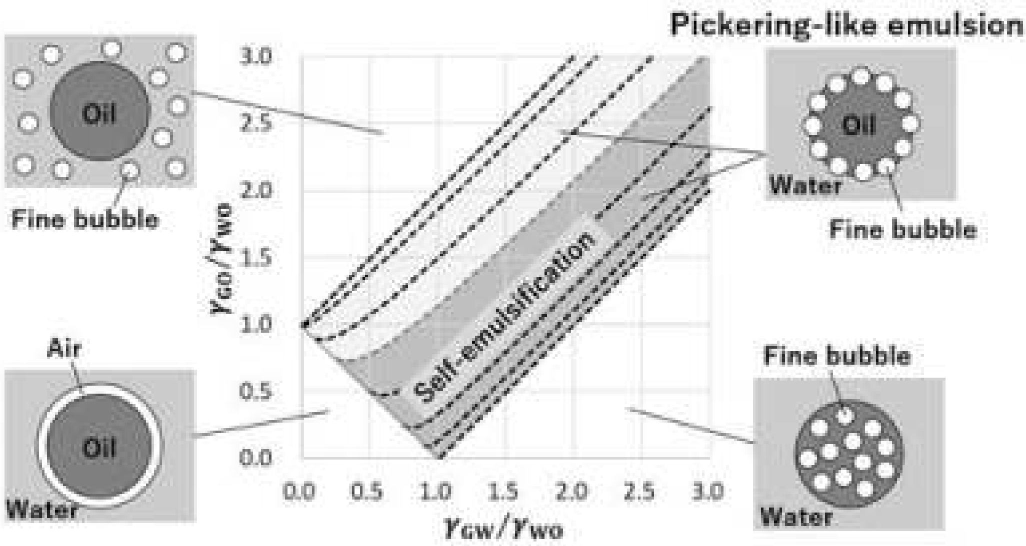

Figure: *Phase diagram of oil-in-water emulsion and bubbles.*

Furthermore, self-emulsification occurs when this energy decrease exceeds the energy required to generate a new water–oil interface. The conditions required for self-emulsification were depicted as a phase diagram of γ_{GW}/γ_{WO} vs. γ_{GO}/γ_{WO}, where γ_{GW}, γ_{GO}, and γ_{WO} represent the air–water, air–oil, and water–oil interfacial tensions, respectively (Figure 1).

Hopefully, these theoretical predictions will enliven experimental studies on the interaction between an emulsion and fine bubbles, including direct observation of emulsions incorporating fine bubbles via the scanning electron microscope and high-speed video camera.

Biography

Tomohiro Onda was a Research Fellow (at present, senior partner) at Kao corporation, who specializes in theoretical physics and interface science. He was engaged in the development of super-water-repellent surface, recordable optical disc, and visceral-fat measurement apparatus. Subsequently, he managed the mathematical science group and mathematically solved scientific problems that arose when developing a variety of products such as cosmetics, cleaning agents, diapers, and containers. His recent research focuses on theoretical investigation of interface phenomena such as wetting, bubble, and emulsion. He received his Ph. D. from the University of Tokyo. He worked as an assistant professor for a few years at the University of Tokyo.

Spin reorientation in layered perovskite oxyfluoride $Pb_3Fe_2O_5F_2$

K. Oka[1], **Y. Nambu**[2,3], **M. Ochi**[4], **N. Hayashi**[5,6], **Y. Kusano**[7], **T. Aoyama**[2], **Y. Ishii**[5], **K. Kuroki**[4], **S. Mori**[5], **M. Takano**[6], **N. Noma**[1], **M. Iwasaki**[1] and **H. Kageyama**[8]

[1]*Kindai University, Japan*
[2]*Tohoku University, Japan*
[3]*Japan Science and Technology Agency, Japan*
[4]*Osaka University, Japan*
[5]*Osaka Prefecture University, Japan*
[6]*Research Institute for Production Development, Japan*
[7]*Okayama University of Science, Japan*
[8]*Kyoto University, Japan*

Control of spin alignment in magnetic materials is crucial for developing switching devices. In molecular magnets, magnetic anisotropy can be rationally controlled by varying their ligands that allow tuning of ligand field splitting energy. However, the inherent weak magnetic interaction between spins or spin-cluster results in spin reorientation (SR) occurring only at low temperatures. Here, we show that layered perovskite oxyfluoride $Pb_3Fe_2O_5F_2$ exhibits a SR transition at 380 K, with the magnetic moments changing from perpendicular to parallel to the c-axis. It is found that the SR is caused by a ferroelectric-like phase transition, where the magnetic HOMO-LUMO interaction changes upon the structural transition due to the concerted effect of the heteroleptic FeO_5F coordination and the steric effect of Pb. This finding indicates that the design of spin orientation by local coordination environment, which is common in molecular magnets, can be extended to extended oxides by introducing different anions.

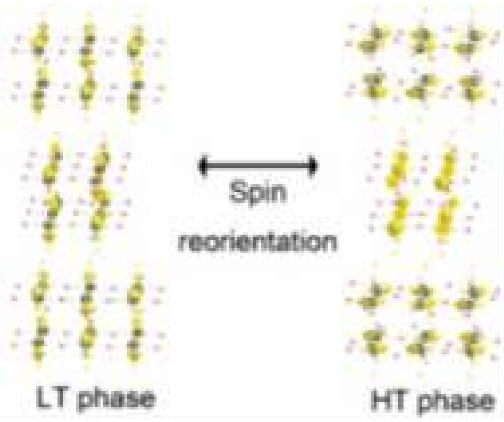

Figure: *Spin reorientation in $Pb_3Fe_2O_5F_2$. The spin orientation changes from perpendicular to parallel to the c-axis during the structural transition from the HT to LT phase.*

Biography

Kengo Oka received the Ph. D. of science from Kyoto University in 2010. He worked as a postdoctoral fellow in Institute for Solid State Physics, The University of Tokyo in 2010, and moved to Materials and Structures Laboratory, Tokyo Institute of Technology as an assistant professor (2010-2014). He was an assistant professor of Department of Applied Chemistry, Faculty of Science and Engineering, Chuo University from 2014 to 2019. He is currently a lecturer at Department of Applied Chemistry, Faculty of Science and Engineering, Kindai University.

Analysis of the solidus temperature of multicomponent steel

Toshio Fujimura, Kunimasa Takeshita and **Ryosuke O. Suzuki**

JFE Techno Research Corp., Japan

Is the assumption of a constant solidus temperature—which has been empirically adopted in general steel solidification analysis without firm validation—valid in all solidification stages? This query has still remained owing to the difficulties in achieving the reliable measurements of the solidus temperature in real processes, while those of the liquidus temperature reasonably agree with phase diagrams.

To examine this assumption of a constant solidus temperature in all solidification stages for multicomponent steels, heat- and solute-transfer equations were simultaneously solved using the finite thickness model, which focuses on early-to-late stage solidification except final stage solidification. In early-to-middle stage solidification, the model provides a constant solidus temperature, as predicted by the previously reported semi-infinite thickness model by the present authors wherein the solidification front was far from the strand center. In late stage solidification, however, the present model exhibited a slightly decreased solidus temperature—almost within the temperature measurement accuracy range. This suggests that the assumption of a constant solidus temperature does not exactly hold in late stage solidification, but is not unreasonable from a practical viewpoint. The obtained solutions agree well with numerical analyses and are in reasonable agreement with thermo-analytical measurements and industrial findings. Thus, the present model supports the assumption of a constant solidus temperature and estimates the solidus temperature in early-to-late stage solidification, which can play a role in search of an adequate solidus temperature as an approximate analytical solution for multicomponent steels.

Biography

Toshio Fujimura is now a technical adviser, JFE Techno Research Corp. He got B.E. and M.E., Kyoto University and Ph.D., Hokkaido University, Japan. He got the Natl. Invention Award of Japan, for "Continuous Forging Process for Continuous Casing", 1997. He worked as the manager of Steelmaking works, Mizushima works. JFE steel, the technical manager, Middletown works, AK Steel, USA, worked as Director, JFE bars &Shapes, Board member of JFE Civil Eng. & Construction and Rinko Corp. and the chairman for the steelmaking subcommittee, Iron and Steel Inst. of Japan.

Integrated hydrobulging of prolate ellipsoids from preforms with multiple thicknesses

Jian Zhang
Jiangsu University of Science and Technology, China

The integrated hydrobulging of stainless-steel prolate ellipsoids from preforms with two thicknesses was investigated. The produced ellipsoids were closed with two 16-mm-thick closures and had nominal semiminor and semimajor axes of 89 and 125 mm, respectively. The ellipsoidal preforms comprised eight conical segments inscribed inside the target perfect ellipsoid. The four end and middle segments of the preforms had nominal thicknesses of 0.67 and 0.83 mm, respectively. The hydrobulging of these preforms was explored analytically and numerically and was compared with that of prolate ellipsoids with constant thickness. Two nominally identical ellipsoidal preforms were fabricated, measured, and hydrobulged to confirm the theoretical predictions. The results indicated that varying the preform thicknesses is an efficient method of overcoming insufficient hydrobulging of the ends of prolate ellipsoids in other methods. This can be achieved by reducing the thickness because lower thickness results in higher equivalent stress. The fabrication of the ellipsoidal preforms and hydrobulging of the prolate ellipsoids were reasonably accurate and repeatable. The prolate ellipsoids were slightly outbulged, but the deviations from nominal geometry were small. Relatively large deviations were observed at the ends and weld seams of the prolate ellipsoids; these deviations were attributed to imperfections in the preforms. The thickness distributions of the fabricated ellipsoidal preforms and hydrobulged prolate ellipsoids were nearly uniform. Moreover, hydrobulging instability can be effectively monitored by measuring geometric dimensions, such as axial height. High residual stresses and plastic strains were observed in the hydrobulged prolate ellipsoids. This tensile residual stress due to internal pressure may be beneficial for underwater applications; however, this phenomenon requires further investigation. The segmented boundaries are subjected to stress and strain concentrations because of the bending effect and geometric discontinuities.

Biography

Jian Zhang was born in Shuyang, Jiangsu, China in 1984. He received his B.S., M.S., and Ph.D degrees in Mechanical Engineering from Jiangsu University. He also received his second Ph.D degrees in Mechanical Engineering from Saitama Institute of Technology, Japan. He was a postdoctoral fellow at Chinese Ship Scientific Research Center. He has worked with School of Mechanical Engineering, Jiangsu University of Science and Technology for about 13 years and has been Professor since 2020. His research interests include buckling of pressure vessels, integrity of pressure hulls, deep-sea pipeline restoration, integral hydro-bulging of shells of revolution.

A modularity design approach to behavioral research with immersive virtual reality: A SkyrimVR based behavioral experimental framework

Yu-Hsin Chen[1] and **Ze-Min Liu**[2]
[1]*College of Liberal Arts, Wenzhou-Kean University, China*
[2]*College of Education, Wenzhou University, China*

Virtual reality (VR) has been shown to be a potential research tool yet the gap between traditional and VR behavioral experiment systems poses a challenge for many behavioral researchers. To address the challenge posed, the present study first adopted a modularity design strategy and proposed a five-module architectural framework for a VR behavioral experiment system that aimed to reduce complexity and costs of development. Applying the five-module architectural framework, the present study developed the SkyrimVR based Behavioral Experimental Framework module (SkyBXF), a basic experimental framework module that adopted and integrated the classic human behaviour experiment structure (i.e. session-block-trial model) with the modifiable VR massive gaming franchise The Elder Scrolls V: Skyrim VR. A modified version of a previous behavioral research to investigate the effects of masked peripheral vision on visually-induced motion sickness in immersive virtual environment was conducted as a proof of concept to showcase the feasibility of the proposed five-module architectural framework and the SkyBXF module developed. Behavioral data acquired through the case study were consistent with those from previous behavioral research. This indicates the viability of the proposed five-module architectural framework and the SkyBXF module developed, and provides proof that future behavioral researchers with minimal programming proficiency, 3D environment development expertise, time, personnel, and resources may reuse ready-to-go resources and behavioral experiment templates offered by SkyBXF to swiftly establish realistic virtual worlds that can be further customized for experimental need on the go.

Biography

Yu-Hsin Chen specializes in both computer science and psychology; moreover utilizes the interdisciplinary knowledge to invent and obtain patents for experimental/diagnostic equipment; collaborating and publishing his work in various EI, SCI and SSCI peer-reviewed journals. Psychological research mainly revolve around facial expressions, emotions, nonverbal deceptive behavioral cues, visual cognition, and time perception. Clinical research focuses on various substance and behavioral addiction. Recent interdisciplinary research involves the integration of virtual reality technology and behavioral research, including but not limited to the development of a framework that combines the data infrastructure of virtual environment creation and expert domain knowledge of experimental psychology to optimize and encourage the utilization of virtual reality technology in psychology and social science research.

Mineral and toxic metal content of tropical stingless bee honey (Apidae; Heterotrigona itama) from Sabah, Borneo

Suzan Benedick, Nurul Hamizah Salman, Lum Mok Sam, Kimberly Ador, Bellericter Binjamin and **Mohd Iftar Johwan Johny @ Hasbulah**

University Malaysia Sabah Sandakan Campus, Malaysia

Honey is a natural product of bees, and its chemical composition depends on the nectar sources of the surrounding flora as well as environmental factors. However, keeping hives in areas polluted with heavy metals can affect the quality of bee products such as honey. To date, there are very few studies on the health risks of consuming honey in various locations in the Malaysian state of Sabah, Borneo, in relation to food standards and heavy metal contamination of honey from the stingless bee, Heterotrigona itama in association with pollutant sources. A total of 63 samples of raw and unprocessed honey were collected directly from beekeepers producing honey at five sites in Sabah comprises of urban and industrial areas. All selected heavy metals were measured using an inductively coupled plasma optical emission spectrophometer (ICP-OES). Overall, the most frequently detected element was Zn (0.090 mg/kg), followed by Pb (0.012 mg/kg), As (0.004 mg/kg) and Cr (0.003 mg/kg), while Cd (0.001 mg/kg) was the lowest element in honey from all areas. Excluding Cr and Zn, a significant correlation was found between PCA factor score 1 and heavy metal concentration in honey for Pb, Cd and As, suggesting that the source of pollution for these metal elements was from hives closer to major roads, cities / town, petrochemical hub and power plants. Although the heavy metal concentrations in the honey samples did not exceed the food standard limits and therefore do not pose a health risk, the observed increase in heavy metal concentrations in honey in industrial areas could pose a potential risk in the future due to the growing interest in rearing of stingless bees for honey production in these areas of Sabah.

Biography

Suzan Benedick has been working as an entomologist at the Faculty of Sustainable Agriculture, Universiti Malaysia Sabah in Sandakan, Sabah State, Malaysia since 2007. She has worked with various researchers from European countries on the biodiversity of many insect groups in Sabah, Malaysian Borneo. Since 1999, she has extensive experience in research on Lepidoptera and Hymenoptera, especially in the areas of insect diversity, insect pests and beneficial insects. She is also consistently a key speaker to the community and industry in Sabah, Malaysia, on the importance of bees as pollinators for agricultural crops, the benefits of bee products for human health, and good practise in rearing stingless bees.

Derivation of the high-T_c version of the BCS optical conductivity of conventional superconductors using the spin polaron theory and matsubara green's functions

Unofre B. Pilil
University of San Carlos, Philippines

In this article we derived the energy gap function, the normal and anomalous Green's functions, and eventually the optical conductivity of 'dirty' high-T_c superconductors at the zero-temperature limit. This process in particular is primarily done by using the Heisenberg equation of motion, the effective Hamiltonian from spin polaron theory, and Matsubara (finite temperature) Green's functions. Having done this, we proceeded to calculate the optical conductivity of 'dirty' high-T_c superconductor by assuming energy conservation but not momentum and by evaluating the Kubo formula. This Kubo formula expresses the current-current correlation function, now as functions of the high-T_c forms of the normal and anomalous Green's functions. Then by using the Wick's theorem made it possible to simplify the product of operators (holons as spinless fermions and bosons as normal bosons). Subsequently, the frequency summations were evaluated using the coherence factors approach. Analytic continuation was then applied in order to obtain the retarded current-current correlation function; after which the zero-temperature limit was taken. The optical conductivity, as a function of the momentum and frequency, was then obtained from the imaginary part of the retarded current-current correlation function. Our result, which is mathematically similar in form as that of conventional superconductors, reveals that the incident photon is absorbed by having its energy converted into two quasiparticles with separate energies.

Biography

Unofre B. Pili is a recent graduate of Doctor of Philosophy in Physics (Ph.D. in Physics) from University of San Carlos in which he is also affiliated as a faculty member of the Department of Physics. For his dissertation, he did research in theoretical high-temperature superconductivity in the spin polaron formulation and finite temperature (Matsubara) Green's functions. At the moment, together with his dissertation adviser, Dr. Danilo M. Yanga, he is deriving the optical conductivity of clean d-wave high-T_c superconductors using the same approach that he employed in his doctoral dissertation but with a different mathematical technique in performing the frequency summations. In addition, he is also deriving the high-T_c version, via spin polaron theory and Matsubara Green's functions, of the BCS derivation of the optical conductivity of 'dirty' low-T_c superconductors at the zero-temperature limit. Also teaching introductory physics, he also does research and publishes in physics education.

Diagnostic performance of acoustic radiation force impulse imaging in evaluating liver fibrosis in patients with chronic hepatitis B infection: A cross-sectional study

Chuong Dinh Nguyen[1], **Hoang Huu Bui**[1,2], **Van Huy Vo**[1], **Sang The Phan**[1], **Phong Tien Quach**[1] and **Dung Bich Nguyen**[1]

[1]University Medical Center of HCMC, Vietnam
[2]University of Medicine and Pharmacy, Vietnam

Background: Acoustic radiation force impulse point shear wave elastography (ARFI-pSWE), measuring shear-wave velocity (SWV), has been utilized to examine the liver stiffness caused by different etiologies. However, information on its reliability in staging liver fibrosis in chronic hepatitis B (CHB) patients is scarce.

Purpose: The aim of the study is to examine the diagnostic performance of ARFI-pSWE and determine the optimal SWV cut-off values to predict significant fibrosis (F ≥2) and cirrhosis (F4) in CHB patients.

Material and Methods: All 114 adult CHB patients visiting the University Medical Center, Ho Chi Minh City, Vietnam between February 2019 and March 2021 underwent liver stiffness measurement using ARFI-pSWE and FibroScan. SWV results were tested against FibroScan for sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). The area under the receiver operating characteristic (AUROC) curve was used to identify the optimal SWV cut-off values.

Results: There was a strong agreement between ARFI-pSWE and FibroScan ($r = 0.92$, $p < 0.001$). The optimal SWV cut-off value for detecting significant fibrosis was 1.37 m/s with an AUROC of 0.975, sensitivity of 83.3%, specificity of 100%, PPV of 100%, and NPV of 81%. The optimal cut-off value for predicting cirrhosis was 1.70 m/s with an AUROC of 0.986, sensitivity of 97%, specificity of 93%, PPV of 95%, and NPV of 96%.

Conclusion: ARFI-pSWE could be an effective technique for evaluating liver fibrosis in CHB patients. SWV cut-off values of 1.37 and 1.70 m/s could be used to diagnose significant fibrosis and cirrhosis, respectively.

Biography

Chuong Dinh Nguyen was born in 1992 in Vietnam. In October of 2016, he received his MD degree from the University of Medicine and Pharmacy at Ho Chi Minh City, and in December of 2019, he received his Internal Medicine resident physician diploma.

He is a young gastrointestinal physician with great passion. He is currently the Chief of the Gastrointestinal Motility Unit at University Medical Center Ho Chi Minh City, Vietnam. In addition to gastrointestinal diseases, his research also focuses on liver fibrosis assessment methods. He was selected for the "Professor Mindie H. Nguyen Award for Outstanding Clinical Research by Early Career Investigators" at the Liver Meeting 2022, organized by American Association for the Study of Liver Diseases.

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Mechanical behavior of graphene reinforced metal matrix composites

G. G . Sozhamannan and **N. Sathishkumar**
Sri Manakula Vinayagar Engineering College, India

In recent years, magnesium-based metal matrix composites have been widely used in many automotive, aerospace, and domestic applications due to their light weight, high specific strength, and excellent damping properties. The mechanical behavior of metal matrix composites mainly depends on the types of matrix and reinforcement materials. The size of reinforcement particles is mostly influenced by the properties of composite materials. In recent years, many researchers have concentrated their research on nanosize particles because they exhibit excellent mechanical properties. The main aim of the presentation is to investigate the mechanical behavior of magnesium-based metal matrix composites. The composites were fabricated by using ultrasonic gravitational stir casting techniques. Nano-graphene particles were used as reinforcement. The mechanical behaviors were evaluated by a tensile test, an impact test, and a micro hardness test. The wear behavior was analyzed by the pin-on-disc method. The composite sample structures were analyzed using a scanning electron microscope. The experimental results revealed that the mechanical behavior of composites is influenced by the presence of graphene particles in aluminum-based matrix composites. The ductile properties decrease, and the tensile, hardness properties are also increased gradually with the addition of nanographene in the matrix materials. Wear test results indicated that wear behavior also depends upon the presence of graphene in the aluminum-based metal matrix composites.

Biography

G.G.Sozhamannan, Professor in the Department of Mechanical Engineering at the Sri Manakula Vinayagar Engineering College, India. He obtained his Bachelor's Degree in Mechanical Engineering in 2001 from Madras University. He received his Master of Engineering in Manufacturing Engineering in 2004 from Annamalai University, and received his Ph.D in 2010 from Anna University. His research addresses the interface bonding strength between an Aluminium Matrix with SiCp reinforcement. He has received a research fellowship from UGC, Inida and recognised as a Research Supervisor by Pondicherry Central University, India. His interests include interface bonding strength, mechanical characterization, and corrosion behaviour of composites. He has published 30 journal articles/book chapter in these areas.

Dielectric properties of alumina-$CaTiO_3$ nanocomposite for biomedical application

P.K. Mallik

Indira Gandhi Institute of Technology, India

Despite being high wear resistance, bioinert and biocompatible, some of the limitations like poor fracture toughness, lack of bioactivity and electrical conductivity properties restrict the use of monolith alumina as bone replacement material. In this paper, we address one such issue and will demonstrate how addition of $CaTiO_3$ (CT) to nano Al_2O_3 matrix enhances bioactivity, physical and electrical properties like dielectric constant and electrical conductivity etc. Therefore, the strategy in the current research is to design a dense alumina Al_2O_3-CT nanobiocomposites using conventional pressure less sintering technique (1400°C, 2 hours) that can be enhanced the functional properties compared to that of monolith alumina. The microstructural as well as functional characterizations were carried out by using XRD, SEM and impedance analyser. As results, the dielectric constant and electrical conductivity increases with function of frequency and temperature was higher compared to other composites. Finally, the results of in vitro analysis indicate that effect of electrically bioactive Al_2O_3-CT nanocomposite will be potential candidate materials for electronic interfacing materials for biomedical application.

Biography

Prafulla Kumar Mallik has been Graduated from Indira Gandhi Institute of Technology (IGIT) Sarang of B.E, 2001, with the specialties including Metallurgical and Materials Engg from the University of Utkal, Odisha, India. Later on, he obtained his post-graduation (MTech & PhD) from University of Indian Institute of Technology (IIT) Kanpur with subjects Materials and Metallurgical Engg. Presently he has been working at the IGIT Sarang, Associate Professor & HOD, Bhubaneswar, Odisha, India, where he has continued his research.

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Soft artificial optical skin for biomedical application

Abhijit Chandra Roy, Navin Kumar, Shreyas B S, Ananya Gupta, Aloke Kumar, Aveek Bid, and **V. Venkataraman**
Indian Institute of Science, India

The human skin being the largest and most exposed organ in the body provides various essential information including touch, temperature, pressure, vibration, and humidity of the surrounding for smooth and safe functioning of our body. Similarly, artificial soft electronic skin, like human skin, perceives various environmental stimuli by transducing them into an electrical signal. Soft artificial skin capable of sensing touch and pressure is essential in many applications, including social robotics, healthcare, and augmented reality. However, several hurdles remain challenging, such as highly complex and expensive fabrication processes, instability in long-term use, and difficulty producing large areas and mass production. Here, we present a robust 3D printable large area soft artificial optical skin made of a soft and resilient polymer capable of detecting touch, load, and bending with extreme sensitivity to touch and load, 750 times higher than earlier work. The soft artificial optical skin shows excellent long-term stability and consistent performance up to almost a year. In addition, we describe a fabrication process capable of producing large areas, large numbers, yet cost-effective. The soft artificial optical skin consists of a uniquely designed optical waveguide and a layer of a soft membrane with an array of soft structures which work as passive sensing nodes. The use of a soft structure provides the freedom of stretching to the soft artificial optical skin without considering the disjoints among the sensing nodes. The soft artificial optical skin's operation has been shown using a variety of techniques.

Biography

Abhijit Chandra Roy started working as a DST-Inspire Faculty at the Indian Institute of Science Bangalore's Department of Physics in year 2017. He earned Ph.D. in Chemical Engineering from the Indian Institute of Technology Kanpur in 2017 and have experience in soft materials and optical technologies. His M. Tech in Bioelectronics and Master of Science in Nanoscience and Technology degrees came from Tezpur University in Assam, India, in 2009 and 2011, respectively. He earned bachelor’s degree in physics in 2007 from Gauhati University in Assam, India. Eleven of his papers has been published in International Journals. He applied for twelve patents, including one in the US and eight in India. The Indian National Academy of Engineering (INAE) awarded him the INAE-Innovative Ph.D. thesis prize in the year 2018 and was selected as a member of INAE, India. He has also received the Gandhian Young Technology Innovation Award (BIRAC-SRISTI).

THz graphene MIMO dielectric resonator antenna

Amarjit Kumar
National Institute of Technology, India

In this work, a two port circularly polarized (CP) MIMO Cylindrical Dielectric Resonator Antenna (CDRA) with Quad-band response is designed for terahertz (THz) application. This antenna is new since MIMO Graphene DRA antennas in the THz frequency range is insignificantly studied. The unique feature of this antenna is, it provides resonance at four bands and provides quad sense CP response in the pass band at THz frequency region. Moreover, by varying graphene potential of the antenna, isolation between the two antennas is increased and CP tuning can also be achieved. The proposed DRA generates two higher order modes (HEM11δ and HEM12δ). This antenna provides 10 dB Impedance Bandwidth (IBW) of 5.86%, 4.96%, 2.64% and 5.23% at four resonant frequencies. The 3dB Axial Ratio Bandwidth (ARBW) is 8.22%, 2.48%, 3.67% and 5.67% at the quad-band frequencies. Various MIMO performance parameters are evaluated and found in acceptable limits. Advantages of the proposed design are quad response, higher order modes generation, CP tuning and good isolation between the ports. The tunability of graphene material allows it to provide CP responses in the frequency region that is most useful in biomedical applications. The use of a CP antenna in a THz biomedical application can improve system sensitivity by reducing polarisation losses and aligning them. All these features make the proposed MIMO DRA a unique and is suitable for THz applications. Figure1 shows the structure of our designed MIMO DRA and Figure2 shows simulation results of |S11| and axial ratio in dB.

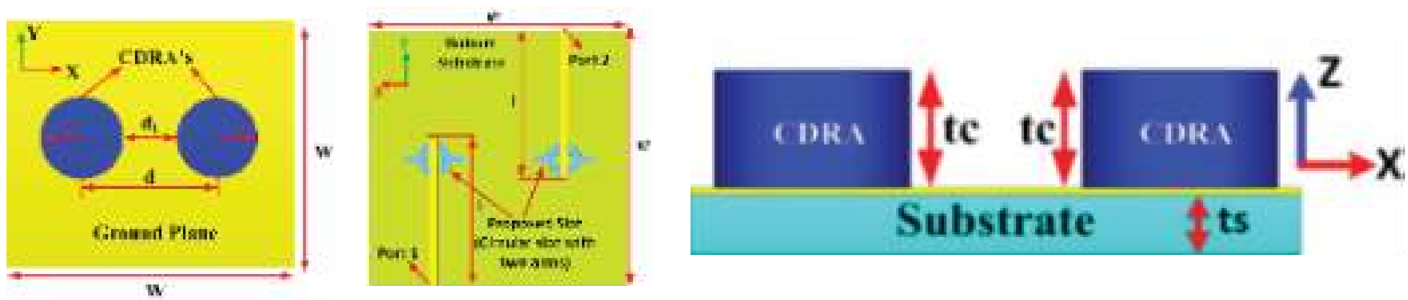

Figure1: *Geometry of proposed MIMO DRA (a) Top View (b) Bottom View (c) Side View*

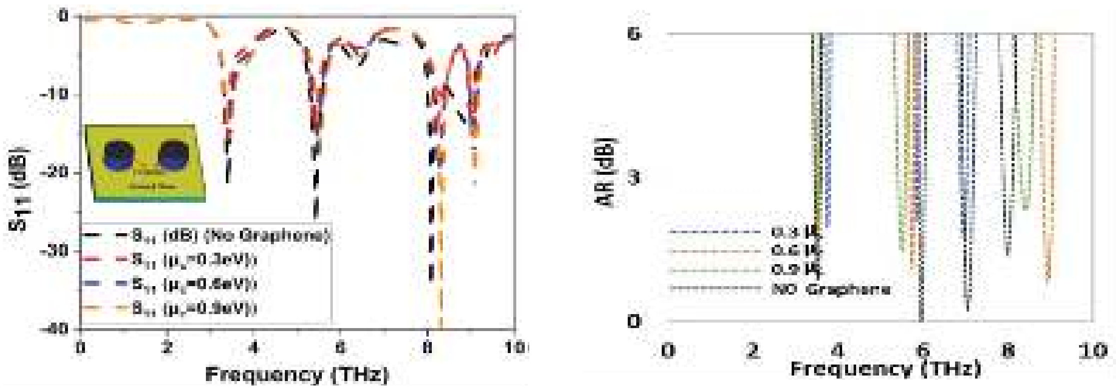

Figure2: *MIMO CDRA (a) Frequency response (b) Axial Ratio in dB*

Biography

Amarjit Kumar has completed M.Tech and Ph.D degrees from Indian Institute of Technology Roorkee India in the year 2012 and 2018. He has about 10 years of research work experience in the development of passive and active RF circuits with concurrent multiband, reconfigurable and multifunctional capabilities for next-generation (5G) wireless applications and Development of RF/microwave sensors for the wireless monitoring of pressure and temperature variations for Industrial Internet of Things applications. He has developed microwave phase shifter, tunable bandpass filters, Wilkinson power dividers, branch-line couplers, planar Antennas, reconfigurable filtering dualband low-noise amplifiers, voltage-controlled oscillator, Wireless sensors using RF transceivers.

He has published around 30 research papers in reputed international journals and conferences. Currently, he is associated with NIT Warangal as an Assistant Professor in ECE department. His current research focus is in design of millimeter-wave and Terahertz (THz) devices for 5G and future 6G wireless communication systems.

Automatic sleep stage classification with reduced epoch of EEG

Sagar Santaji
KLS Gogte Institute of Technology, India

In the recent years analysis of Electroencephalogram (EEG) signal has played vital role in automatic sleep scoring technique. Classification of sleep stages help in understanding sleep related issues. Manual analysis of sleep scoring is costly, tedious and time-consuming process. It is essential to design an automatic sleep scoring technique which is convenient to patients and simplifies the diagnostic process using EEG signals. Implementation of such technique enable experts to identify sleep related issues. In this paper, EEG signals are recorded for 60 subjects and preprocessed using Infinite Impulse Response (IIR) filter. Sleep stages are classified into three major stages viz stage 1, 2 and 3 with 10 s epoch duration using statistical features of EEG and machine learning algorithms with five-fold cross validation. Proposed method is more feasible for physicians to diagnose sleep disorders and proves to be the better technique with improved accuracy compared to other existing studies.

Biography

Sagar Santaji, B.E in Electronics and Communication Engineering, M.Tech in Digital Communication Networking , Ph.D in Bio Medical Signal Processing.

Work/Recognition/Achievements

1. Best Project award for "Sleep Classification Using Machine Learning" by Karnataka State Science Council and Technology in 2019
2. Research Collaboration with University of Toronto, Canada
3. Research Collaboration with University of Tennessee, USA
4. Published 7 papers in peer reviewed Journals on the topic Bio Medical Signal Processing, Machine Learning

Subject Expertise

Digital Communication, Information Theory, Wireless Communication, Sensor Networks.

Porphyrin: An emerging next generation functional molecule for energy related applications

D.V Bhuse
Vellore Institute of Technology, India

The upsurge in energy demand have laid burden on fossil fuels. This burden will eventually lead to depletion of fossil fuel. Fossil fuels are detrimental to the environment. The alternatives for fossil fuels are still in prototype stage. To date, technology utilizing ruthenium-based complexes in catalysis, perovskites and inorganic compounds (including silicon metal) in energy conversions and carbonaceous-oxide multiparty and mesoporous compounds in energy storage have shown excellent performance in the respective fields, however often suffer from various critical issues. The attempts are being made to eradicate these issues by designing the newer multi-functional materials for use in greener way in catalysis, truly energy conversion devices and efficient energy storage materials.

In this context, the nature-based biological agent, porphyrins and their derivatives are promising and are being developed because of its versatile and tuneable properties that mimics the principle of photoenergy-conversion in light harvesting and in biological catalysis. Porphyrin can be engineered to cope with the desired characteristics to design a new functional motif and are expected to make a major contribution in the near future. At present, A metal free porphyrin derivative incorporated with ionic liquids have been emerged as excellent photocatalyst under greener protocols giving a very good yields, stability, recyclability in several C-C, C-H bond formation and other organic transformations. The oligomeric porphyrin structures with several donors, accepting agents and conjugation have recently shown appreciable 9.3% PEC in a truly energy generating DSSC system. The doping of these structures with variable oxidation states enables it for the use faradaic type electrode material in supercapacitors. The porphyrin-carbonaceous based electrode material presents a typical stable type nanostructured surfaces morphology giving mixed type of capacitance with 571 F/g at 1.0 A/g supercapacitance and better capacitance retention.

This talk review the use of porphyrin-based materials for emerging key applications such as energy conversion, energy storage and photo catalysis. It is divided into three key sections focusing on latest development of porphyrin-based materials in photovoltaics, photocatalysts, and energy storage devices.

Biography

Darpan Vijaykumar Bhuse received his bachelor’s degree in Chemistry from Rajaram College, Kolhapur, Maharashtra, India. Perused his master’s degree in Analytical Chemistry from Jaisingpur College Jaisingpur, Kolhapur, Maharashtra, India. He received his doctorate degree (PhD) in Dye sensitized solar cell and Photocatalysis from Vellore Institute of Technology, VIT, Vellore. His research is focused on Porphyrin synthesis, DSSC and Supercapacitor.

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Lead-Free transducer design for non-invasive continuous glucose monitoring using photoacoustic spectroscopy

P. K. Sanki and **PNSBSV Prasad V**

SRM University, India

The quick spread of the new coronavirus particularly increases the vulnerability of diabetics. Diabetes is already regarded as a pandemic illness. WHO estimates that there are 422 million people worldwide who have diabetes, omitting a significant portion of the population who have not yet received a diagnosis. Invasive, semi-invasive, and non-invasive methods can all be used to determine the blood glucose levels in the body. It is still usual practice to get a blood sample invasively in order to determine the blood glucose level. To detect blood glucose levels from capillary fluid, certain Self-Monitoring Blood Glucose Meters (SMBG) have already been released on the market. Frequent blood glucose monitoring by invasive or semi-invasive techniques results in localized infection spread, discomfort, irritability, and patient dread. The development and progression of related illnesses such retinopathy, nephropathy, cardiomyopathy, and neuropathy are reduced by 40–80% when blood glucose levels are closely monitored and controlled. However, there is still no known permanent treatment for diabetes. For diabetic individuals, non-invasive procedures (NIP) that continuously monitor glucose levels may be an option. A non-invasive method for glucose measurement is provided by spectroscopy methods. A deterministic scientific method called PhotoAcoustic Spectroscopy (PAS) is used to find glucose in the Near Infra-Red (NIR) spectrum. The Photoacoustic (PA) measurement apparatus was constructed, and PA measurements were made on glucose solutions at multiple NIR excitation wavelengths. The generated PA signal has been extracted with the help of a piezoelectric transducer. The Peak-to-peak amplitude of the PA signal increases in direct proportion to blood glucose levels.

Restriction of Certain Hazardous Substances (ROHS) advised against using lead in electronic appliances due to the negative environmental impact of lead zirconate titanate (PZT-5A) material. For a lead-free transducer, the mixture of barium zirconate titanate (BZT) and barium calcium titanate (BCT) appears promising and fits the general criteria for piezoelectric properties (Table 1). Compared to our prior output findings, we predict an instrument with enhanced efficiency and resolution.

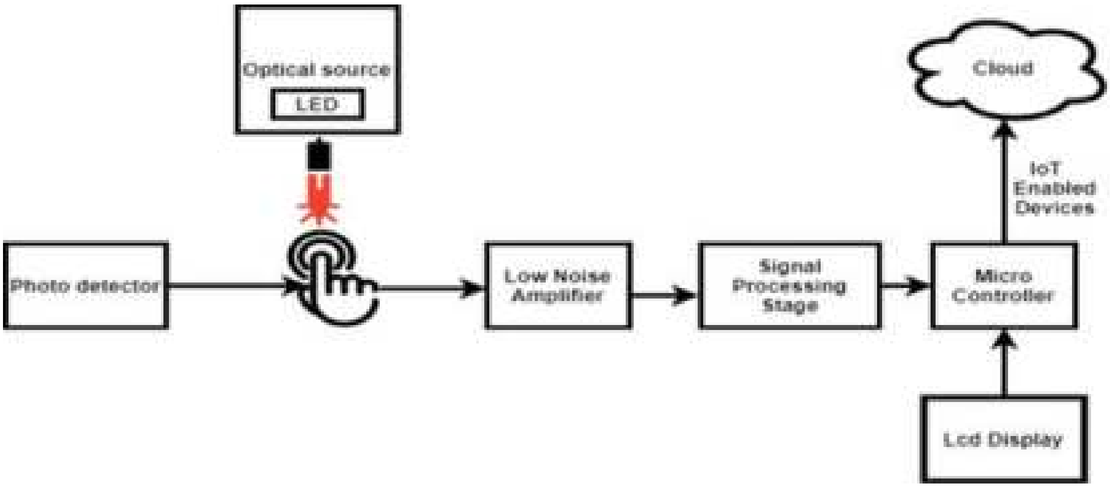

Figure: *Block diagram for the noninvasive continuous glucose monitoring system*

Table: *Comparison of piezoelectric properties for Lead and Lead-Free materials*

Sl.No	Property	PZT-5A	0.50 BZT-0.50BCT	0.51BZT-0.49 BCT	0.52BZT-0.48 BCT
1	d_{33} (PC/N)	400	637	577.5	481.5
2	g_{33} (mv M/N)	25	29	23	22
4	Coupling coefficient (k_p)	0.61	0.59	0.54	0.42
d_{33}= Charge Sensitivity, g33= Voltage Sensitivity					

Biography

Pradyut Kumar Sanki received his B.Tech. and M.Tech. degrees from West Bengal University of Technology, India in 2006 and 2008 respectively, and a Ph.D. degree from the Department of Electronics and Electrical Communication Engineering, Indian Institute of Technology Kharagpur, India in 2017. He served NIIT University, Neemrana, KIIT University, Bhubaneswar and Alliance University, Anekal as an Assistant Professor after graduation. He is currently employed as an Assistant Professor in the Department of Electronics and Communication Engineering, SRM University-AP, Andhra Pradesh. He now holds the positions of faculty coordinator, IETE, ISF, and counsellor, IEEE Student Branch. His research interest includes digital VLSI design, biomedical instrumentation, and digital signal processing. He has authored over 20 publications in peer-reviewed international journals and conferences. He has also authored a book and a book chapter in international publication and is an inventor in three Indian Patents. He recently received a Core Research Grant (CRG) with an approximate budget of 33 Lakhs from the DST-SERB, Government of India.

FTIR spectrum of soil organic carbon changes (SOC) by the growth of rubber tree (Hevea brasiliensis) seedlings in soils with varied pH and base status

K.K. Ambily and **M.L. Geethakumari Amma**
Rubber Research Institute of India, India

Identification of soil components and soil organic matter characterization by functional group differentiation are the important applications of Fourier transform infrared spectroscopy (FTIR). Study intended to identify the FTIR spectra of changes in the carbon functional groups by the growth of rubber seedlings in three different pH and base cation soils between initial and after 240 days. Weighed, sieved soil samples powered in an agate mill were homogenized and mixed KBr (FT-IR grade) and the pellets were made using a hydraulic press at 12 bar, dried FTIR Spectra recorded with a Spectrophotometer (Varian 660 – IR FTIR) with specified resolution. Results indicated that the spectrum of all three soils comprised of the clay mineral (left portion) organic matter (middle portion) and minerals (right portion) in the peaks obtained in three soils. The spectrum of the two acidic soil (pH 4.4 and pH 5.5) were similar and these were different from the neutral soil (pH 7.4). In pH 4.4 and pH 5.5, 6 peaks in the left portion were similar. This corresponds to the clay minerals and naturally these were identical in the acidic soils dominated in Kaolinite clay mineral. But in pH 7.4 among the 6 peaks two were present and instead of other peaks there was a broad peak corresponds to the centre point at intensity of 3400 cm-1associated with the hydrogen bonding with the functional group OH and it is a determining factor of the presence of exchangeable cations like K, Na, Ca and Mg. This was the confirmation of the characteristic difference in pH 7.4 soil from pH 4.4 and FTIR spectrum is applicable in identification of soil differentiation by carbon groups.

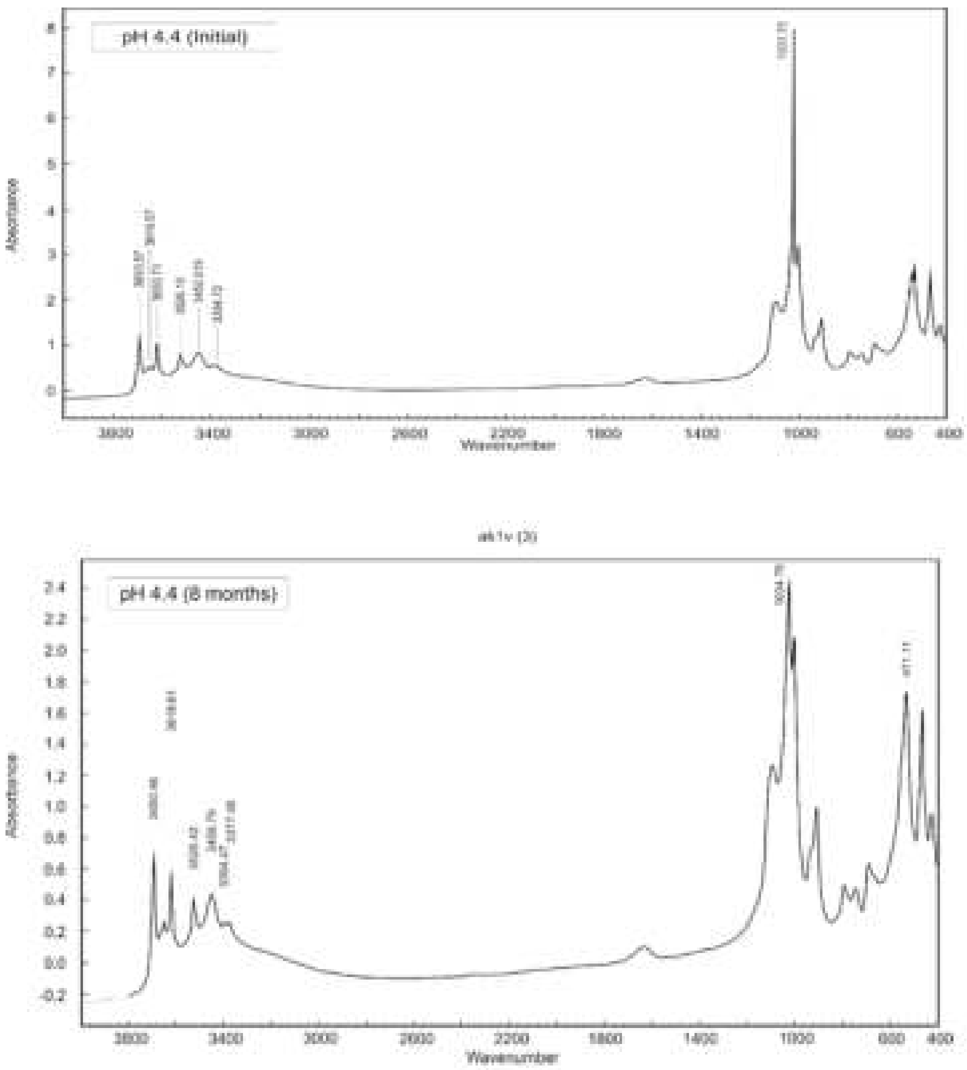

Figure: *FTIR spectrum of changes in soil organic carbon in the initial and after eight months growth of rubber plants in pH 4.4 (extremely acidic) soil*

Biography

Ambily. K.K, Senior Scientist (Soils &Agricultural Chemistry) in Agronomy/Soils Division of Rubber Research Institute of India, Rubber Board, Kottayam, Kerala, India. She received my Ph. D degree in Chemistry on the topic “Rhizosphere Chemistry and adaptations of Natural Rubber (Hevea brasiliensis) to acidic soil conditions’’ from Mahatma Gandhi university, Kottayam, Kerala, India. Received Master’s Degree in Analytical Chemistry and graduate degree in chemistry from the same university. Presently she is a Senior Scientist(Agronomy/Soils) and engaged in research on Rhizosphere chemistry on rubber trees, soil fertility and fertilizer recommendation for rubber, FTIR spectrum identification of carbon functional groups in soils, plant nutrition related to yield, potassium and drought tolerance of Rubber clones, elemental profiling of rubber clones and tree parts of rubber trees of the major disease Tapping panel dryness affected trees and environmental studies like carbon sequestration potential of clones. Involved in the development of online fertilizer recommendation programme “RUBSIS- Rubber Soil Information System” for offering online fertilizer recommendation for rubber. 25 related publications including Research articles in Peer-reviewed journals, National and International seminars/conferences, and book chapter and received training programmes of the concerned fields. Reviewer of the international journals Plant and Soil, Journal of Plant and Soil Science.

Optimization study on sliding wear characteristics and heat treatment conditions of different grades of ferritic ductile cast iron

V. Bramaramba and **S. Sen**
NIT Rourkela, India

The present work reports an experimental investigation on influence of microstructures on dry sliding wear performance of different grades of ferritic ductile iron. Ductile cast iron samples of ferritic grade have been subjected to different heat-treatment processes at different temperatures and times. Taguchi optimization technique (L16) has been applied to evaluate the influence of different process variables (load, time, heat treatment, and grade) during ball-on-plate wear test. Meanwhile, analysis of variance (ANOVA) method was adopted to know the significance of aforesaid process variables. ANOVA results confirmed that the heat-treatment process has highest significance (54.76%) within all process variables. Among heat-treated specimens, austempered samples have outstanding wear resistance while the DMS samples have lower wear resistance. In addition, overall utility values have been evaluated by using individual utility values of weight loss and hardness. An obtained overall utility value gives the optimum combination for achieving higher wear resistance and hardness. Additionally, morphology of wear surfaces was examined in scanning electron microscope and the micrographs confirm the existence of inferior surface in terms of abrasive wear, adhesive wear, and particle pullout and delaminated sheets on wear track. Enrichment of oxygen element has been observed on the worn path through energy-dispersive X-ray spectroscopy. X-ray diffraction analysis confirms the existence of different compounds like iron and silicon oxides on the wear track surface which may improve its hardness.

Biography

Bramaramba.v has been a process and mechanical engineer for new product development for aluminium alloy wheels at synergies castings limited for two years. She completed her masters in CAD/CAM specialization. Later she joined as PhD scholar in metallurgical and materials engineering department in national institute of technology Rourkela, India. She is expertise in heat-treatment study, mechanical and physical metallurgy on ductile cast iron and Alsi7mg alloys. She has published three international journals on wear behavior and morphological study on ductile cast iron on different heat treatment processes. Currently, she has written tensile and compression behavior on ductile cast iron on different heat treatments, which will be published in early 2023.

High Thermal Stability of the RF dielectric properties of the $BiVO_4$ matrix added with ZnO

D. X. Gouveia[1], **R. G. M. Oliveira**[1], **D. C. Souza**[1], **J. E. V. de Morais**[1], **G. S. Batista**[1], **D. B. Freitas1**, **M. A. S. Silva**[1], **Sergei Trukhanov**[2,3,4], **Alex Trukhanov**[2,3,4], **Larissa Panin**[4,5], **Charanjeet Singh**[6], **Di Zhou**[7] and **A. S. B. Sombra**[1]

[1]*Federal University of Ceará, Brazil*
[2]*National University of Science and Technology MISiS, Russia*
[3]*South Ural State University, Russia*
[4]*National Academy of Sciences of Belarus, Russia*
[5]*Immanuel Kant Baltic Federal University, Russia*
[6]*Lovely Professional University, India*
[7]*Xi'an Jiaotong University, China*

In this work, the complex impedance spectroscopy study of bismuth vanadate ceramics ($BiVO_4$) ceramics with different additions of ZnO (25, 50 and 75 wt%) it is performed. The $BiVO_4$ (BVO) was synthesized by the reaction method in solid state and calcined at 500 ºC and the BVO-ZnO composites were molded in sintered ceramic pellets at 700 ºC. The X-Ray Diffraction (XRD) was used to analyze he crystal structure of BVO and composites BVO-ZnO, none being observed synthesis spurious phase. Analysis by Complex Impedance Spectroscopic (CIS) showed that increasing the concentration of ZnO, reveals the presence of a thermo-activated charge transfer process with activation energy increasing for the sample with 25 wt% ZnO. At room temperature, the increase in the ZnO concentration in the BVO matrix maintained the high value of the dielectric constant (ε), in the order of 104 at the frequency of 1 Hz. The temperature coefficient of capacitance (TCC) displayed positive in the BVO and negative for composites. The adjustment through the equivalent circuit, presented excellent electrical response for the composites, being identified an association with three Resistors (R), each in parallel a Constant Phase Element (CPE), showing the influence of grain and grain boundary in the process of thermoactive conduction.

Biography

Daniel Xavier Gouveia, born in Fortaleza, Brazil (1951) has a degree in electronic engineering from the Federal University of Paraiba (1976), a Master's degree in Electrical-Electronics Engineering from the Federal University of Ceará (1996), a PhD in Physics from the Federal University of Ceará (2006). Post doctorate from the University of Aveiro, Portugal (2006/2007). He also had experience as an engineer in the machinery and electrical instrumentation industries. Since 1998 he has been a professor at the Federal Institute of Science, Education and Technology (IFCE-Ce). He is a collaborator of LOCEM (LOCEM-Telecommunication and Materials Science and Engineering of Laboratory) since 2005, with interest in dielectric properties of materials.

Effects of serum albumin on the photophysical characteristics of synthetic and endogenous protoporphyrin IX

I.E. Borissevitch[1], **D.C.K. Codognato**[1], **F.S. Pena**[2], **E.R. dos Reis**[3] and **A.P. Ramos**[1]

[1]*Universidade de São Paulo, Brazil*
[2]*EcoFarm Alimentando Vidas, Brazil*
[3]*Universidade Estadual de Campinas, Brazil*

Protoporphyrin IX (PpIX) is an intrinsic compound of living organisms that plays an important role as a precursor of heme synthesis. On the other hand, PpIX is attracting special attention as a photosensitizer (PS) in photodynamic therapy (PDT), a non-invasive method for the treatment of cancer and other diseases, including bacterial and viral infections, and as a fluorescence probe in fluorescence cancer diagnostics (FD). The study of the interaction of synthetic protoporphyrin IX (PpIXs) and protoporphyrin IX extracted from Harderian glands of ssp Rattus novergicus albinus rats (PpIXe) with bovine serum albumin (BSA) was conducted in water at pH 7.3 and pH 4.5 by optical absorption and fluorescence spectroscopies. PpIXs is present as H- and J-aggregates in equilibrium with themselves and with monomers. The PpIXs charge is 2^- at pH 7.3 and 1^- at pH 4.5. This increases its aggregation at pH 4.5 and shifts the equilibrium in favor of J-aggregates. In spite of electrostatic attraction at pH 4.5, where BSA is positive, the binding constant (K_b) of PpIXs to BSA is 20% less than that at pH 7.3, where BSA is negative. This occurs because higher aggregation of PpIXs at pH 4.5 reduces the observed Kb value. At both pH, water-soluble PpIXe exists in the monomeric form with the charge of 1^- and its K_b exceeds that of PpIXs. At pH 4.5, its Kb is 12 times higher than that at pH 7.3 due to electrostatic attraction between the positively charged BSA and the negatively charged PpIXe. The higher probability of PpIXe binding to BSA makes PpIXe more promising as a fluorescence probe for fluorescence diagnostics and as a photosensitizer for photodynamic therapy. The existence of PpIXe in the monomeric form can explain its faster cell internalization.

Biography

Iouri Borissevitch is a full professor, now retired, the Head of the Photobiophysics group at the Physical Department of the Faculty of Philosophy, Sciences and Letters in Ribeirão Preto, São Paulo University (DF-FFCLRP-USP). He was formed in Lomonosov Moscow State University in 1969 as a biophysicist. Since 1969 to 1994, he worked as a scientific researcher at the Department of Chemical and Biological Processes at the Semenov Institute of Chemical Physics of the Russian Academy of Sciences. In 1994, he was invited to São Paulo University (Brazil) as a visiting professor and in 1999 was accepted as a docent at DF-FFCLRP-USP, where he organized the laboratory of Photobiophysics. From the beginning of his scientific life, his interests has been focused on the effects of light in biological objects and their application in medicine.

The zygoma anatomy-guided approach (ZAGA) for rehabilitation of the atrophic maxilla

André Sakima Serrano[1], Jan Peter Ilg[2] and **Carlos Aparicio[3]**
[1,2]Private practice at ZAGA Center São Paulo, Brazil
[3]ZAGA Center Barcelona, Spain

A protocol to perform a prosthetically driven minimally invasive zygomatic osteotomy, named zygoma anatomy-guided approach (ZAGA) is introduced. The ZAGA method aims at promoting a patient-specific therapy by adapting the osteotomy type to the patient's anatomy. In most cases, this method avoids the opening of a window or slot into the lateral wall of the maxillary sinus before implant placement. Instead, a mucoperiosteal flap, including the posterior maxillary wall and the superior zygomatic rim, is raised to allow visual control of the complete surgical field. The surgical management of the implant site is guided by the anatomy of the patient according to specific prosthetic, biomechanic, and anatomic criteria. The ZAGA Concept represents the logical evolution of the extra-sinus technique and ZAGA classification previously described. The results of using the combination of the ZAGA Concept together with the new ZAGA implant designs consistently show less traumatic osteotomy; better implant stability; improved bone to implant contact, and bone sealing around the implant neck. Additionally, the rate of late complications such as oral–sinus communication or soft tissue recession dramatically decreases when compared to the original technique.

Biography

André Sakima Serrano is a zygomatic implant expert and oral and maxillofacial surgeon. He is one of the owners and leading surgeons at ZAGA Center São Paulo. Also, he works in the leading hospitals in São Paulo city and has experience in Orthognatic Surgery, TMJ Surgery, Implantology (All-on-4 and Zygomatic implants), facial trauma and wisdom teeth. To this day he has 18 years of experience in the rehabilitation of atrophic maxilla.

Nanocellulose biobased composite overlays

Gregory T. Schueneman[1], **Endrina S. Forti**[2], **Daniela B. Jimenez**[2], **Robert J. Moon**[1] and **Jeffrey P. Youngblood**[2]

[1]*Forest Products Laboratory, USA*
[2]*Purdue University, Indiana*

Building on prior research of TEMPO-oxidized cellulose nanofibril (TOCNF) sheet lamination with room temperature curable epoxy, we elucidated further mechanistic phenomena by varying the toughness of each overlay and effected an improvement of the brittle/ductile interface adhesion. Previously we found that TOCNF laminates underwent brittle failure via slight delamination at the ductile to brittle layer interface followed by rupture of the brittle layer. As the ductile layer was reduced in thickness the tendency for delamination increased due to suppression of its energy storage resulting in greater stress transfer to the TOCNF layer to an extent that it underwent micro-cracking. In this recent study we reduced the brittleness of the TOCNF with a water-soluble polymer and evaluated the effects on performance and damage mechanism as a function of the ductile layer's rigidity. In addition, we evaluated the effect of interfacial adhesion, using a silane coupling agent to improve the stress transfer between the ductile and brittle layers. These modifications were completed while maintaining optical appearance.

Biography

Greg joined the USFS Forest Product Lab in 2009 as project leader of RWU 4707 Forest Biopolymer Science and Engineering and served in this role for 12 years. This unit focuses on research and development of advanced structures, composites, and nanotechnology. Prior to joining FPL he had 10 years of industrial experience working with Loctite, Henkel, Fairchild Semiconductor, and Mapei. During this time he gained experience with the materials science and development of nanocomposites, structural adhesives, sealants, semiconductor packaging materials and processes, and emulsion based adhesives. He received B.S. and M.S. degrees in Materials Science and Engineering from the University of Florida and a PhD in Polymer Science and Engineering from University of Massachusetts at Amherst. His primary research goals are directed at overcoming the fundamental challenges toward control and tailoring of lignocellulosic nanomaterials and the performance and durability of the composites derived from them.

BIOGRAPHY

Im Sampen is a Principal Investigator funded by NIH, the Department of Defense (DoD), Veterans Affairs (VA) and Foundations as a multidisciplinary osteoarthritis (OA) pain research group. Her research has been instrumental in establishing preclinical rodent models to examine mutual cause-and-effect relationships in OA that link tissue degeneration with pain. She has served on multiple NIH and Foundation study sections administered by NIAMS, VA, or international funding agencies. She also served as an Editor-In-Chief for Gene Reports or Executive Editor (Gene) and an Editorial board member of numerous international journals. She has been a member of the Orthopaedic Research Society (ORS) since 2000 and served the ORS as Nominating Committee (elected), an Executive Member of Women's Leadership Forum and Asian Leadership Forum member. She received various awards and honors, such as the Arthritis National Research Foundation Scholar Award, OARSI Investigator Award, Kappa Delta Elizabeth Winston Lanier Award from the ORS, and VA Research Scientist Award.

Hee-Jeong Im

University of Illinois at Chicago, USA; Jesse Brown Veterans Affairs Medical Center, USA

A single intraarticular injection of nanotechnology-based drug formulation as a safe osteoarthritis disease-modifying drug

Osteoarthritis (OA) is a leading cause of chronic pain and disability, affecting >500 million adults globally. Clinically accepted treatment strategies are often ineffective, and opioids have been traditionally recommended as options for OA pain, contributing to a social problem – the opioid crisis. The expression level of vascular endothelial growth factor (VEGF) is highly connected with OA severity1-4. Recently, we identified distinct roles for VEGF receptors: VEGFR1 is primarily responsible for joint pain transmission, and VEGFR2 is for cartilage degeneration5,6. Intraarticular (IA) injection (twice/week) of pazopanib, an FDA-approved selective inhibitor of VEGFR1/VEGFR2, markedly reduced joint pain and inhibited cartilage degeneration. To facilitate IA treatment of pazopanib in clinical settings, we developed a nanotechnology-based drug formulation for prolonged and sustained drug efficacy (referred to as nano-PAZ). We validated the drug efficacy of a single IA injection of nano-PAZ in two different OA models in different species (mice, rats) for reduced pain and pathology at different stages of OA disease progression (inflammatory, early-and, advanced OA). Toxicologic evaluations were done for safety using In Vivo Imaging analyses and drug abuse liability tests to ensure no addiction properties. A single IA injection of nano-PAZ abolished joint pain for >16 weeks in our preclinical animal models, in part, via reduction of (i) nerve growth factor (NGF) and its cognate receptor TrkA in the synovium and dorsal root ganglion (DRG) sensory neurons; (ii) NFkappaB and spinal glial activity. In conclusion, a single IA injection of nano-PAZ rapidly reduces knee joint pain and protects cartilage at any stage of OA disease progression, suggesting its potential as a novel OA disease-modifying drug. Nano-PAZ could be rapidly translatable to clinical settings not only for knee OA but also for a broad spectrum of musculoskeletal pain, including low back pain.

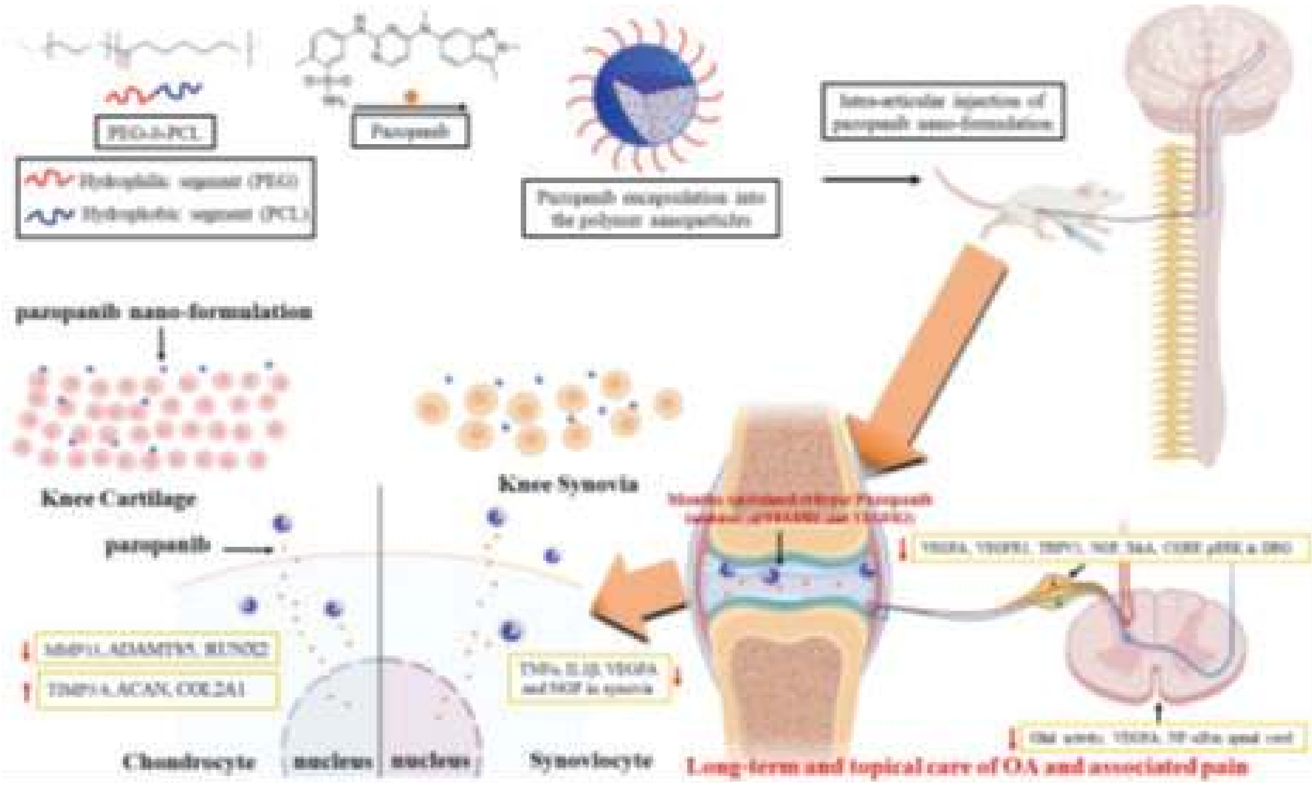

Figure: *Schematic diagram of one-time injection of nanotechnology-based drug formulation of pazopanib (nano-PAZ) for OA treatment.*

PEERS ALLEY MEDIA

SCIENTIFIC ABSTRACTS

DAY 2

VIRTUAL EVENT

5th Edition of

ADVANCED MATERIALS SCIENCE WORLD CONGRESS

March 27-28, 2023

ADV. MATERIALS SCIENCE 2023

A new type of silica-induced "moundless" pitting corrosion in copper observed in Japan

M. Sakai
Muroran Institute of Technology, Japan

A new type of pitting corrosion in copper, namely "moundless" corrosion, has recently been reported in Japan. This type of pitting corrosion has some unique morphological features that differ from ordinary types of pitting corrosion, such as type I or type II. Firstly, this type of pitting corrosion has no mound of corrosion products that cover the mouth of the pit. In addition, a glassy verdigris exists around the pit. Furthermore, the pit measures <1 mm in diameter, but is extremely deep. We herein present and discuss the morphological aspects and water quality features of moundless pitting corrosion after field surveys and field tests in Noboribetsu City, Hokkaido Prefecture. In addition, a laboratory experiment is conducted using synthetic freshwater to reproduce the moundless pitting corrosion. The various corroded copper tube specimens are then examined by a range of analytical techniques, including X-ray diffraction (XRD), energy dispersive spectroscopy (EDS), Fourier transform infrated (FT-IR) spectroscopy, optical microscopy. XRD and FT-IR analyses revealed that the verdigris around the pit was amorphous and a copper-

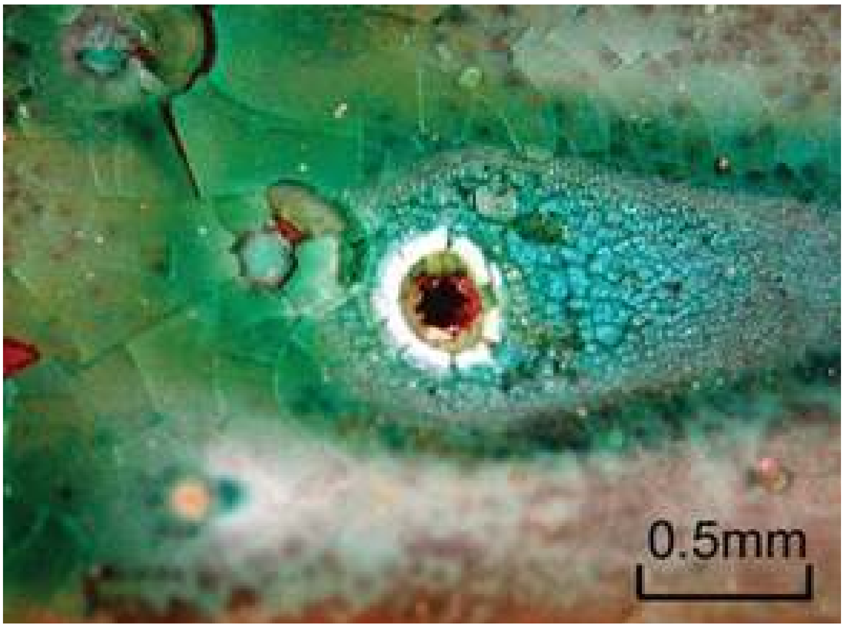

Figure: *Moundless pitting corrosion in copper* containing silicate mineral chrysocolla. Upon examination of the water quality of various regions of the Noboribetsu City to determine the prerequisites for pit formation, it was found that the silica level was higher than the average Japanese level. In addition, the levels of sulfate ions in pitting detected area were also higher than the Japanese average, while those of bicarbonate ions were lower than the Japanese average. Furthermore, we succeeded in reproducing moundless pits in Noboribetsu City using a 4-year field test. Following this simulation, we found that the mouths of some pits were closed in the early stages, and that these pits were covered with thin films that contained mainly silica. It was therefore concluded that the formation of moundless pits is largely dependent on the water quality, and silica is considered indispensable for their generation.

Biography

Masahiro Sakai is an associate professor of College of Design and Manufacturing Technology at Muroran Institute of Technology. His work focuses specifically on the corrosion of non-ferrous metals, especially a copper and an aluminum.

Antibiotic-resistant superbugs on nanomaterials and nanoplastics

S. Joo and **H. Kim**
University of Seoul, South Korea

The increasing manufacture of nanoproducts and plastics has resulted in a significant concern regarding unknown chronic effects upon exposure of nanomaterials and nanoplastic particles to humans. Indeed, nanoparticles and nano-sized plastic debris are found everywhere, in the environmental media via various sources including consumer products and transport pathways. Because of the heterogeneous properties of nanomaterials and nanoplastics, addressing toxicity becomes a challenging issue, particularly with regard to emerging contaminants of concern (e.g., superbugs) adsorbed on nanomaterials and nanoplastics. This presentation provides three objectives, namely (1) toxicity assessment of nanomaterials and nanoplastics (2) exploring toxicity mechanisms of antibiotic-resistant superbugs adsorption on nano-sized particles, and (3) addressing environmental and public health risks of nanomaterials and plastic debris. Data from recent publications were used to address the aforementioned three objectives. A case study on antibiotic-resistant superbugs adsorbed nanomaterials will be illustrated in this presentation. Given the review on antibiotic-resistant superbugs adsorbed nanomaterials, the development of green strategies and the application of biodegradable materials to the manufacture of consumer products are encouraged.

Biography

Joo is currently co-leading the Plastic-Free Specialized Graduate School at the University of Seoul. She was an Environmental Engineering Professor at the University of Miami, Florida USA, and is an affiliate of the Dr. John T. McDonald Biomedical Nanotechnology Institute. She has over 20 years of experience in Environmental Engineering and Science. She has expertise in the field of Environmental Nanotechnology, Toxicity Assessment of Nanomaterials, and Innovative Processes of Water/Wastewater Treatment. She is a recipient of multiple awards and has published research and review papers in prominent scientific journals and is the author of books.

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Investigation on fracture behavior of cementitious composites reinforced with aligned hooked-end steel fibers

Sujjaid Khan, Longbang Qing, Iftikhar Ahmad, Ru Mu and **Mengdi Bi**
Hebei University of Technology, China

Aligning steel fibers is an effective way to improve the mechanical properties of steel fiber cementitious composites (SFRC). In this study, the magnetic field method was used to prepare the aligned hooked-end steel fiber cementitious composites (ASFRC) and the fracture behavior was investigated. In order to achieve the alignment of steel fibers, the key parameters including the rheology of the mixture and magnetic induction of electromagnetic field were theoretically analyzed. The orientation efficiency factor of ASFRC and SFRC was 0.8 and 0.58, respectively.

The results showed that, compared with SFRC, the cracking load and the ultimate load of ASFRC were increased about 24–55% and 51–86%, respectively, depending on the fiber addition content. In addition, the flexural tensile strength and residual flexural strength of ASFRC were found to increase up to 105% and 100%, respectively. The orientation of steel fibers also has a significant effect on energy consumption. The fracture energy of ASFRC was 56–70% greater than SFRC and the reinforcement effect of hooked-end steel fiber was higher than straight steel fiber. It was concluded that the fracture properties were enhanced significantly by the orientation of steel fibers. The fractural properties of ASFRC with Vf = 0.8% were found to be superior or equal to those of SFRC with Vf = 1.2%, which confirmed the advantage of ASFRC over SFRC and obtained high fracture properties, at a lesser amount of steel fibers, compared to SFRC. The fibers in the fracture surface showed that not only was the number of fibers of ASFRC higher than that of SFRC, but also the orientation efficiency factor of ASFRC was superior to SFRC, which explains the improvement of fracture behavior of ASFRC.

Biography

Sujjaid khan is a Pakistani civil engineer, did his Bachelor degree from Sarhad university of science and information technology (2013-2017) and for further master degree moved to china, Tianjin on Chinese government scholarship where he graduated from the school of civil and transportation engineering of Hebei university of technology (2018-2022) in good grades, memories and enlighten ambitions. He organized many scientific events throughout his graduate studies. During this time, he published two articles in renowned journals, working on the alignment technique of hooked ended and straight fibers in aligned and random directions and investigating fractured properties. He is passionate about science, technology and human experiences. He is always looking for initiatives to promote research and make it more accessible.

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Classification of fungal diseases in plant based on deep learning techniques

Mallikarjun Hangarge[1] and **Sukanya S. Gaikwad**[2]
[1]Karnatak Arts, Science and Commerce College, India
[2]Gulbarga University, India

India has a wide range of agricultural and ecological varieties. India is the leading producer of milk, pulses, jute, rice, wheat, sugarcane, vegetables, fruits, and cotton. The average yield of many Indian crops is inferior. Plant diseases are one of the significant causes of the low yield of crops. These diseases are caused by micro-organisms such as bacteria, viruses and fungi. This article reveals the research findings of the classification of fungi-affected diseases of popular fruit plants such as Apple, Custard Apple and Guava based on their camera-captured (14,412 images) and microscopic images (602 images). Besides, it calculates the infected area of the leaf for further processing. The experimental results are exciting and highly encouraging to justify as state-of-the-art results, i.e. 97.52%.

Sample Dataset used for experiments.

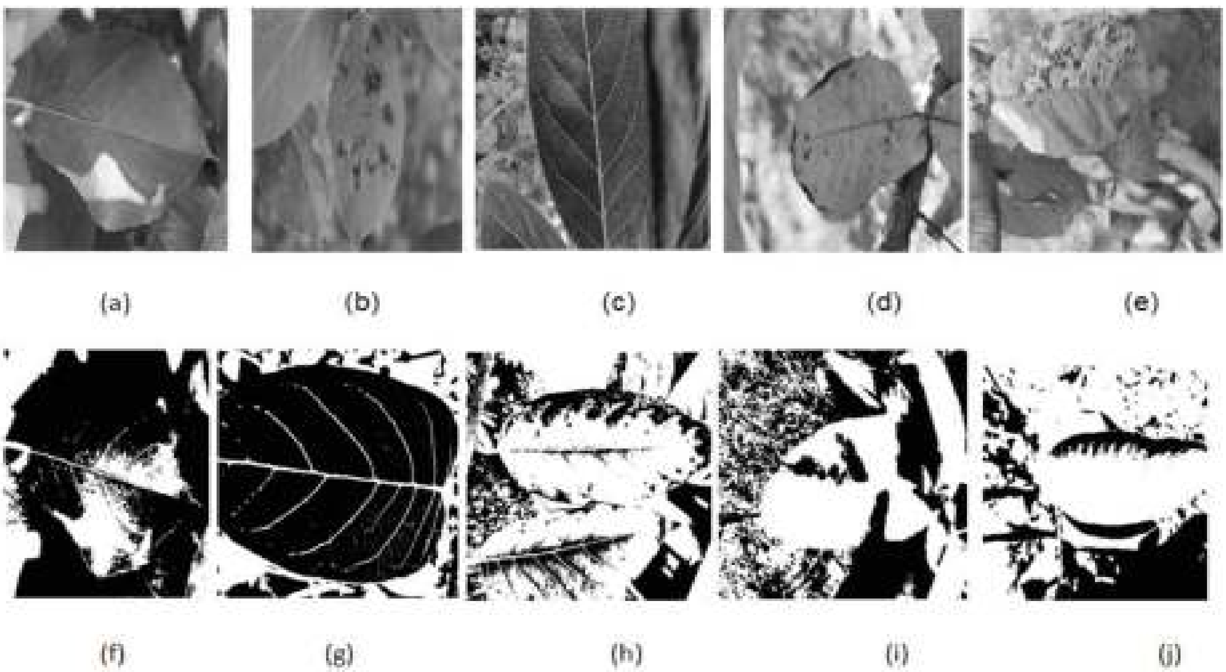

Figure: (a) Apple- healthy (b) Apple- Scab (c) Custard apple- healthy (d) Guava- leaf spot (e) Guava- rust

Deep-learning techniques for fungal diseases classification

Using Transfer Learning				
	Precision	Recall	F1score	Accuracy
AlexNet	0.9366	0.9386	0.9376	95.3%
SqueezeNet	0.8757	0.8905	0.8832	90%
ResNet50	**0.9634**	**0.9278**	**0.9538**	**97.52%**
Using Feature Extraction				
KNN	0.8329	0.8362	0.8346	82.6%
LDA	0.9198	0.9482	0.9338	93.4%
SVM	0.9091	0.9229	0.9159	91.7%

From the above table, it is evident that ResNet50 model gave good classification accuracy of 97.52% compared to the other models on the Microscopic image dataset.

Biography

Mallikarjun Hangarge, Associate Professor and Head Department of P. G. Studies and Research in Computer Science, Karnatak Arts, Science and Commerce College, Bidar. He received a prestigious IAPR Travel grant to attend ICPR in Hongkong in 2006. UGC Travel grants to present his research at ICDAR, 2013 at Washington DC USA, in 2013. He has received three Best Paper Awards at International conferences. He received Faculty Summer Research Fellowship in 2012 from the Indian Academy of Sciences. He has completed three major research projects of Rs. 30.0 lakhs. He has collaborated with the University of South Dakota, USA, Computer Vision and Pattern Recognition Unit, Indian Statistical Institute Kolkata and Speech Processing Laboratory, IIIT Hyderabad. His research interests are in Image Processing and Pattern Recognition and its applications such as Automatic Handwriting Analysis, Document Image Processing, etc. He is the author of more than 100 research articles and three books published in reputed International and National Journals and conferences. He serves on the Editorial Board of 6 International Journals.

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Tungsten oxide–reduced graphene oxide composites for photoelectrochemical water splitting

Shahzad Munir Ansari and **M. Zubair Khan**
Federal Urdu University of Arts, Science and Technology, Pakistan

Photo Electro Chemical (PEC) water splitting is the latest technology to produce safe hydrogen and electricity by using sun light. This technology permits to split water in to its basic constituents i.e. hydrogen and oxygen. Hydrogen being highly flammable gas can be used as fuel in different sectors of life to overcome the energy needs. Oxygen gas can be utilized by the human beings for respiration. The process resembles with photosynthesis of plants to prepare food in the presence of sun light. Tungsten Oxide (WO_3) and reduced Graphene Oxide (rGO) were the materials used under different compositions to fabricate PEC cells for production of safe electricity. The low band gap of tungsten oxide (WO_3) enables it as a suitable candidate for PEC water splitting. Graphene Oxide (GO) is a material having extra thin sheets and a very large surface area with extreme electrical conductivity. GO has been synthesized by using modified Hummer's method. Later on hydrothermal reduction of GO gives rGO. WO_3–rGO composites of different ratios have been prepared hydrothermally and then coated on indium tin oxide coated glass to make electrodes for water splitting. Renewable energy technologies have their immense scope after the scarcity of fossil fuels. Various characterization techniques such as UV–visible, Diffusion Reflectance Spectroscopy, X-ray

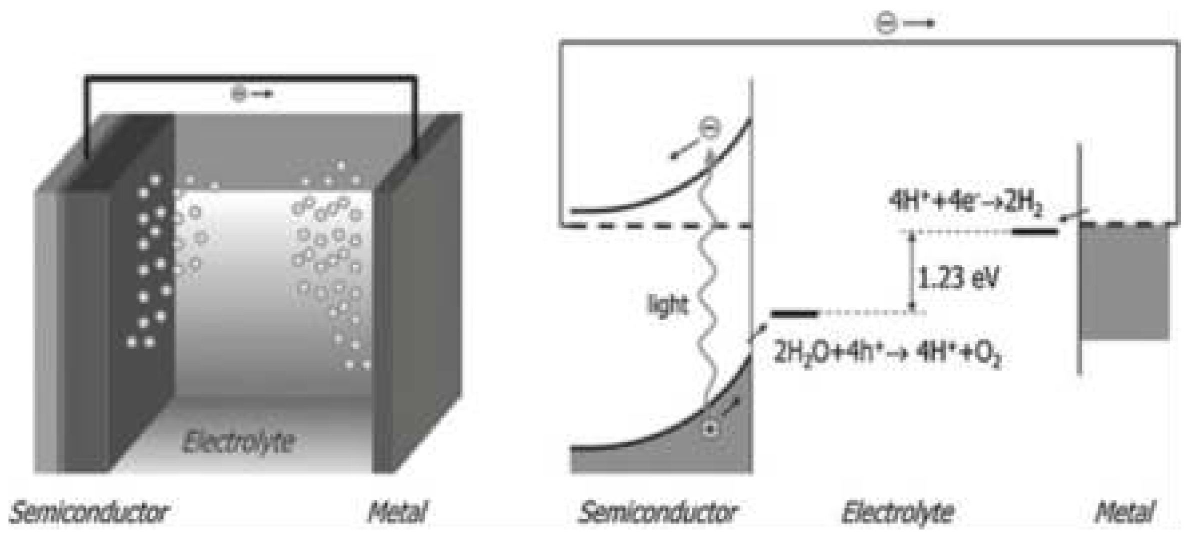
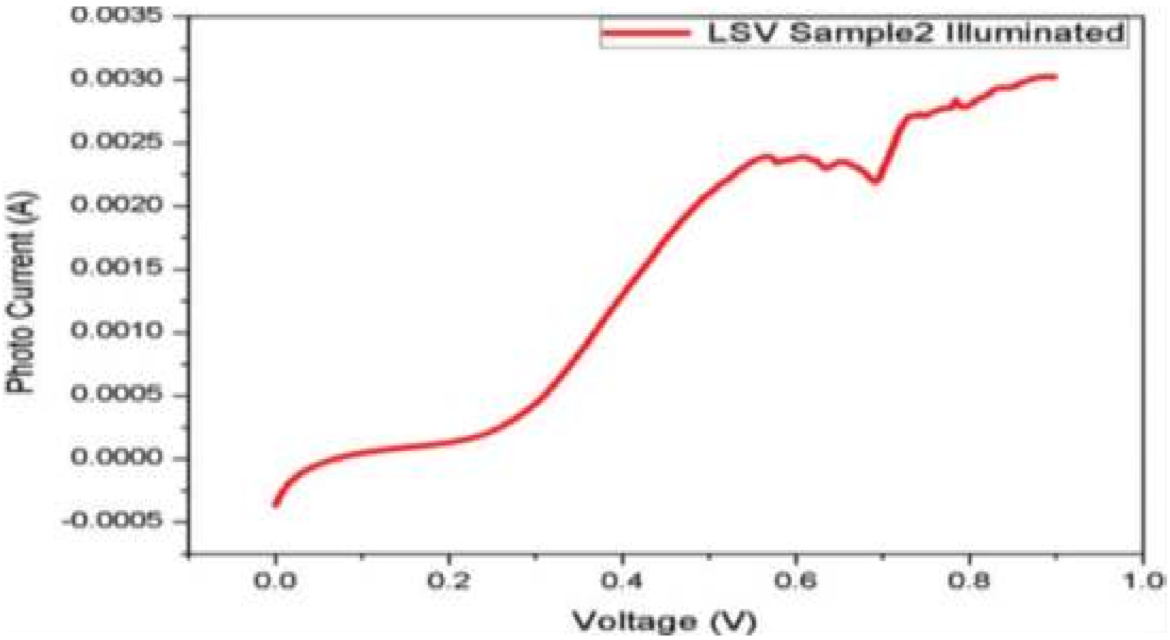


Photo Electro Chemical Water Splitting and Photo Current of 3.2 mA

Diffraction, Scanning Electron Microscopy and Linear Sweep Voltammetry were used to study the absorbance/reflectance, structure, morphology, and optical/electrical properties of prepared nanostructures. In addition, WO_3 particles were distributed on the strong sheets of rGO randomly. The IV-measurements were taken of WO_3 / rGO electrodes under dark environment (very minor current~250 nA) by using LSV. The electrodes exhibit maximum of ~ 450 μA under dark environment, while photocurrent initiates from 1.0 mA to 3.2 mA under artificial sunlight. That is convincingly an exceptional result in the field of PEC cells.



Sr.No	Sample Name	Quantity (rGO:WO_3)	Ratio	Temperature
1	rGO	Starting Material	N.A	N.A
2	Sample 1	300mg:200mg	3:2	180⁰C
3	Sample 2	350mg:250mg	3.5:2.5	195⁰C
4	Sample 3	200mg:100mg	2:1	200⁰C
5	Sample 4	500mg:250mg	2:1	210⁰C

Biography

Shahzad Munir Ansari is a PhD fellow of Federal Urdu University of Arts Science and Technology, Islamabad, Pakistan in Applied Physics Department. He earned Degree of Masters of Philosophy in Applied Physics with specialization in the field of renewable energy technology mainly focused on "Novel Materials for Energy Applications" from the same university. Because of the remarkable properties of Graphene, his research is focused on it with its different compositions. He served as Researcher at National Centre for Physics Islamabad Pakistan for two years. He has hands on experience of Synthesis of Graphene / Graphene Oxide / reduced Graphene Oxide and their different compositions with metal oxides and other semiconductor materials for various energy applications. He has published two research articles in the well-known international scientific journals. Recently prepared Copper Plated-Graphene Based Ultra Capacitors and their testing is in progress. In the meanwhile research and development is going on Graphene Batteries.

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Luminescence studies on Eu^{3+}: B_2O_3-SrO-TiO_2-LiO - Al_2O_3 glasses

M. Priya and **A. Antony Suresh**
Saveetha Engineering College, India

Luminescence studies on Eu^{3+} ions doped in Borate glasses ($7TiO_2+3Al_2O_3+(60-x)B_2O_3+xEu_2O_3+5LiCO_3+25SrCO_3$) (where x =0.05, 0.10, 0.15 and 0.20), containing heavy metals, alkali and alkaline were prepared using a conventional melt quenching technique. Judd-Ofelt (JO) intensity parameters were determined from the luminescence spectra and used to investigate the nature of Eu^{3+} ions with its surrounding ligands. The JO parameters (Ω_2, Ω_4 and Ω_6) were used to determine the radiative spectroscopic properties such as radiative transition probability (A_R), branching ratio (β_R) and stimulated emission cross-section for the $5D_0$-->$7F_{2,4,5}$ transitions of Eu^{3+} ions. Theoretically optical gain parameter and gain bandwidth were calculated, shows a vital role in laser application. The higher values of Ω_2 confirms the hypersensitive nature of the $5D_0$-->$7F_2$ transition and further it indicates the covalent nature of the Eu-O bond and higher asymmetry of all the prepared glasses. Among the prepared glass in 0.2 mole Eu^{3+} doped glass found to have better values. The stimulated emission cross-section, branching ratio and quantum efficiency for the glass corresponding to $5D_0$-->$7F_2$ transition is found to be 8.98 $\times 10^{-22}$ cm^2, 0.62 and 80.2% which indicates its suitability for red laser application.

Biography

M. Priya has a doctoral degree in Physics and her research passion is on Alkali Halides, High-temperature crystals, Nanomaterials, and Metallic glasses. Having a research experience from 2005, she had published nearly 75 papers in international, high-impact journals. Seven of her Ph.D. scholars are awarded doctorate degrees and she is guiding five more scholars in various fields of materials research. She is a reviewer for many high-impact journals. She has completed two funded projects successfully and currently, one project with BRNS funding is ongoing. She has published three patents and was granted two patents.

She visited China for Research Collaboration(bulk crystal growth) and as Visiting Professor at Changchun University, China. She also conducted many conferences & webinars for knowledge sharing which helped the research community to carry out research work with Indian and International Scientists.

Chitosan nanoparticles and their application in agriculture

K. Divya[1] and **M. S. Jisha**[2]
[1]Apple International School, UAE
[2]Mahatma Gandhi University, India

The demand for food is increasing day-by-day in line with the ever-increasing population. This puts extra pressure on the agricultural world to increase production within the limited land available for agriculture. Application of chemical fertilizers seems to be the only solution to double or triple the yield from the same area of land. Similarly, chemical pesticides are also extensively used to eliminate the pest and pathogen problem that can reduce the yield per area of the crop. However, these solutions have proven to have adverse long-term effects on the soil quality and biodiversity of agricultural lands. Chemical fertilizers and pesticides are also the number one agricultural pollutant. The freshwater sources have been contaminated with hazardous agricultural pollutants making it undrinkable. Overall, these chemicals have a very dis-advantageous impact on health and ecosystem. Chitosan obtained from the shell waste of crustaceans are a promising alternative for the chemical fertilizers and pesticides that are one of the main reasons of agricultural pollution. Chitosan nanoparticles (ChNP) have been reported to have very good plant growth promoting capacity in many crop plants. There are many studies demonstrating the positive effect of ChNP on promoting plant growth of various crops such as rice, wheat, tomato etc. Owing to the antimicrobial activity of ChNP, it has shown to elicit plant defence reactions against many plant pathogens in plants. The biological origin of chitosan makes it non-toxic in nature. The soil toxicity, seed toxicity and cytotoxicity studies done on ChNP supports the fact that ChNP is a non-toxic compound. In this review, we will be observing the recent works on the agricultural application of ChNP.

Biography

Divya Koilparambil is a committed research scholar with excellent research potential and an ability to actively contribute to the research projects as well as a proven publication track record. She is currently working as Science Coordinator at British Curriculum School, Apple International School, Dubai She guides and mentors Science teachers of Key stage 2 and Key stage 3 in planning and delivering high quality lessons to students. She is also a Review Editor for Frontiers in Microbe and Virus Interactions with Plants. Her key responsibilities are to ensure that experiments and studies were conducted correctly, considering appropriate ethical considerations, and that the conclusions are based on a valid, logical interpretation of the results. She was the Research Topic Coordinator for Research Topic Collection of Frontiers Journal of Drug Delivery; Section: Oral Drug Delivery "Chitosan Nanoparticles Preparation and Application for Oral Drug Delivery".

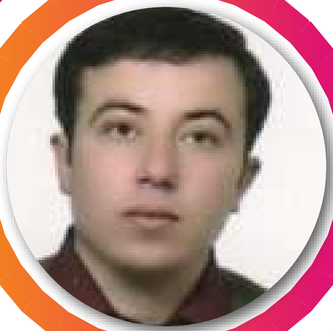
Causal analysis of company performance and technology mediation in small and medium enterprises during COVID-19

Ashraf Mishrif and **Asharul Khan**
Sultan Qaboos University, Oman

The COVID-19 pandemic has caused significant changes in companies and affected the operational capacity of small and medium enterprises (SMEs) worldwide, pushing them further towards technology adoption and innovation. However, the extent to which the impact of use of e-commerce, technology, and digitalization on companies' sales, operations, customer satisfaction, and their overall performance during COVID-19 has not been investigated. The aim of this study is to conduct a path analysis assessment of performance and technology mediation in SMEs during the pandemic. The path analysis suggests existence of statistically significant partial mediation by the mediator variables (SMEs' digitalization, use of technology, and use of e-Commerce during COVID-19) between independent variables (SMEs' operation, sales, and customer satisfaction) and the dependent variable (SMEs' performance). Operation, sales, and customer satisfaction directly affected SMEs' performance during COVID-19. There was also an acceleration in the SMEs' technology transformation during this period.

Biography

Ashraf Mishrif is the founding director and research chair of Oman Chamber of Commerce and Industry Research Chair for Economic Studies, Sultan Qaboos University, Oman. Prior to that he was Associate Professor at King's College London and taught at various universities including Qatar University, Ahmed bin Mohammed Military College Qatar, Anglia Ruskin University Cambridge, and the University of Greenwich, London, UK. He assumed several executive posts including Cultural Advisor for the Egyptian Embassy Cultural Bureau in London, Managing Director of the London-based consulting firm EU-Med International, and International Advisor and member of the Academic Board of Directors, Boston Business Management School, Singapore. He is an expert in economic development and the political economy of the Middle East, with a special focus on the Gulf region. He established and led several research clusters, masters and doctoral programs in political economy, foreign direct investment, international trade, economic diversification, and Euro-Arab economic relations. He provides advisory services to international organizations and governments including UNCTAD, UK Trade and Investment, Islamic Development Bank (Saudi Arabia), and Social Fund for Development (Egypt), Chambers of Commerce, Authority of Development of SMEs, Authority of Industrial Estates, and Special Economic Zones (Oman). He manages several strategic research projects and regional development programs, with a research budget of US$1.2 million and 32 research staff. He is Fellow of International Society for Development and Sustainability (Japan) and the Book Series Editor of Palgrave Macmillan Political Economy of the Middle East. He authored and edited several books, book chapters and peer-reviewed papers, including two volumes on economic diversification and nationalization of the labour market in the GCC.



Domination of pythagorean fuzzy gragh

Sadegh Banitalebi[1] and **Rajab Ali Borzooei**[2]
[1]*Imam Hossein University, Iran*
[2]*Shahid Beheshti University, Iran*

A Pythagorean fuzzy model has more flexibility to deal with human evaluation information than other fuzzy and vague models. In this article, the notions of normal arc, normal dominating set, normal domination number, abnormal independent set, abnormal independent number, normal cobondage set, and normal cobondage number are introduced, and some the relevant results are investigated. Eventually, a utilization relevant to decision making according to influencing factors on the company's efficiency is presented. The presented model is a factor-based model, where the impact score of each factor is divided into two types of direct and indirect influence.

Biography

Sadegh Banitalebi specialized PhD in mathematics and a lecturer and researcher in the field of mathematical modeling, fuzzy mathematics, fuzzy logic and cognitive modeling.

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Direct cost analysis for 32,783 samples with preanalytical phase errors

Pinar Eker
Maltepe University Faculty of Medicine, Turkey

Objective: Errors in the laboratory process often occur in the preanalytical phase (PA). The study aims to calculate the direct cost elements of PA errors, including material, logistics, transfer, personnel workforce, and medical waste.

Methods: Medical laboratory PA phase errors were retrospectively reviewed using the Laboratory Information Management System. We evaluated the whole 2019 laboratory data of the 836-bed Health Sciences University Umraniye Training and Research Hospital (UTRH). We assessed the direct cost elements of PA errors, such as those related to material, logistics, transfer, human resources, and waste. We performed the procedure for both samples analyzed in the hospital and transferred to the central laboratory.

Results: We analyzed 1,939,650 patient samples and 46,534,532 parameters studied in 2019 for UTRH. The rates for rejected tests and rejected samples (tube) for UTRH were noted as 0.32% and 1.7%, respectively. The total direct cost for PA errors was TRY 438,284.51 (68,918.07 euros) for 32,783 patient samples and 147,893 tests. We calculated the total cost for PA test errors detected in the hospital as TRY 390,238.06, while the total cost for PA test errors detected in the central laboratory was TRY 48,046.45. 89% of the total cost was for PA errors detected in the hospital, and 11% was for the errors detected in the central laboratory. The 2019 direct PA error cost we calculated based on our hospital's data was 0.153% of the 2019 hospital operating cost. We calculated the direct cost per rejected sample as TRY 13.37 (2.1 Euro).

Conclusion: Providing reliable laboratory service with the least possible financial loss is one of the main goals in terms of laboratory medicine. In achieving this goal, the prevention of error costs is a priority. The direct cost elements for the PA phase, where laboratory errors are concentrated, can be easily identified. The amount of PA phase error direct cost will attract the attention of health policy decision-makers and field professionals and inspire further research. Therefore, we tried to determine a threshold cost regarding interventions and practices required to prevent PA phase errors.

Biography

Pinar Eker graduated from Ege University Faculty of Medicine in 1991, became a biochemistry and clinical biochemistry specialist in 1997, and have a master's degree in quality management in healthcare. She worked in different public hospitals in Istanbul, Turkey as a Biochemistry specialist for 20 years and as the director of the biggest and the first consolidated medical laboratory in Turkey since 2013, which processed more than 20.000 samples daily. She worked at Maltepe University Faculty of Medicine since 2021 and as medical laboratory director of Memorial Health Group of Hospitals in Turkey in Istanbul.

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Modelling strength data sets via modified weibull distribution

H. Unozkan[1,2]
[1]Halic University, Turkey
[2]Coventry University, United Kingdom

There are a lot of techniques for obtaining new statistical distributions. Weibull distribution is one of the most capable statistical distribution in modeling strength data sets. Basic principle of gaining new distribution is increasing modelling efficiency. In this study a new distribution is proposed by taking the conditional diagonal section of the bivariate Farlie-Gumbel-Morgenstern distribution of which marginal distributions are Weibull distribution. Specifications and characteristics of this new distribution are studied. The structure of the proposed distribution is discussed statistically and the parameter estimation for the new distribution is made by known methods. In addition, reliability analysis has performed. Efficiency on the statistical modeling of the new distribution can be detected by using data sets in literature. The new distribution which is proposed in this study, is compared with Weibull distribution, which is the most known strength statistical distribution, in modeling efficiency. The Kolmogorov Smirnov test statistics was used as a compare method in modeling efficiency of distributions. In Kolmogorov Smirnov test statistics there is a p-value statistic which can be used as explanation rate of the dataset in the model. According to this statistic, modelling efficiency of Weibull Distribution can be improved by 20%. It is concluded that this new distribution offers a model that can be used effectively in strength datasets. With this approach, other statistical distributions modelling efficiency can be improved. Therefore, any researcher who wants to work with a specific distribution, but does not have enough goodness of fit, can increase efficiency with this method.

Biography

Huseyin Unozkan took Bachelor degree in System Engineering from Turkish Military Academy in 2006, later took Master and Doctorate degrees in Ankara University Statistics Department in 2016 and 2020. He is currently working as an Assistant Professor in Halic University and managing an international project in Coventry University in United Kingdom. Research areas of Huseyin Unozkan are; Statistical Theory, Statistical Distributions, Stochastic Processes, Reliability Analysis, Mathematical Modeling, Optimization, Cluster analyses, Artificial Neural Network, Machine Learning Algorithms.

Advances in illicit drugs detection at points of care

Ghadeer M. M. Abdelaal
Zagazig University, Egypt

Introduction: Illicit drug analysis is widely applied in daily practice all over the world to overcome the rising crisis of drug addiction. Thus, the need for decentralization of the laboratory confirmatory methods to be portable and suits point of care (POC) settings has become a recent trend. Gas chromatography-mass spectrometry (GC-MS) is the traditional confirmatory gold standard for drug testing and is used for non-targeted substance screening, however, it uses large laboratory equipment, and it is limited to volatile non-polar compounds. Liquid chromatography-tandem MS (LC-tandem-MS) has become a new gold standard for its ability to identify more types of analytes (polar and non-polar), however, it is not suited for neither non-targeted drug screening nor for POC settings as it is not portable.

Aim: Discuss the most advanced portable techniques for illicit drugs detection at point of care (POC) settings.

Results: The emergence of miniature ambient ionization MS, that is portable and can analyze unprepared samples in native environment within one minute. Ion mobility spectrometer (IMS) is another advance that can identify compounds including isomers with high resolution within seconds and portable devices are available. Portable Raman and near infrared (NIR) spectrometers have allowed fast screening for drugs and have been efficiently used for other on-site forensic applications. Hence, these advanced techniques are promising for quick detection of illicit drugs in a POC setting.

Conclusion: Miniature ambient ionization MS is very rapid with no sample preparation, but it is more expensive than other alternatives in POC testing. Thus, the best methods for POC drug testing are portable IMS, portable Raman spectrometer, and handheld NIR spectrometer for their accurate, easy, and quick analysis within seconds with affordable costs.

Biography

Ghadeer M. M. Abdelaal Senior lecturer of Forensic Medicine and Toxicology. Faculty of Medicine, Zagazig University. Fellow of the Egyptian Forensic Medicine Authority in Cairo. Senior consultant at Forensic Medical Consultation Center of Zagazig University. A founding member of Zagazig Forensic and Clinical Toxicology Research Lab. A founding member of the Safe Woman Unit in Zagazig University Hospitals. Member of the Arab Union of Forensics and Toxicology. Member of the Egyptian Society of Clinical Toxicology. TEDx Speaker "Tomorrow's techniques for yesterday's crimes" talk. Speaker and organizer at many conferences. Forensic postgraduate quality coordinator. Strategic planning, and resources coordinator at the faculty quality assurance unit (2019-2021). Internship Qualification Program trainer in the professional GP course (2018). Participated in the Continuous Improvement and Qualifying for Accreditation Project (2012). Participated in Zagazig University's strategic planning (2011). Medical convoys' organizer in Sharkia, Egypt (2011). She has many international scientific publications in the field of Forensic Medicine and Toxicology.

Analysis of straightness and flatness errors based on Python

A. El Melegy and **S. Zahwi**
National Institute of Standards, Egypt

Calibration of surface plates becomes necessary demand in production metrology. These plates are considered as reference planes for many types of dimensional measurements. This study presents an analysis of straightness and flatness errors on the calibration of surface plates. A laser interferometer system is used in calibration of granite surface plate based on Union Jack method. The calibration is carried out using foot spacers of 2, 4 and 6 inches. A new method based on Python is proposed for statistical assessment of errors in each case. The sample size due to 4 inch foot spacer is most comparable for plate calibration. The associated uncertainties and measurement results are evaluated and compared.

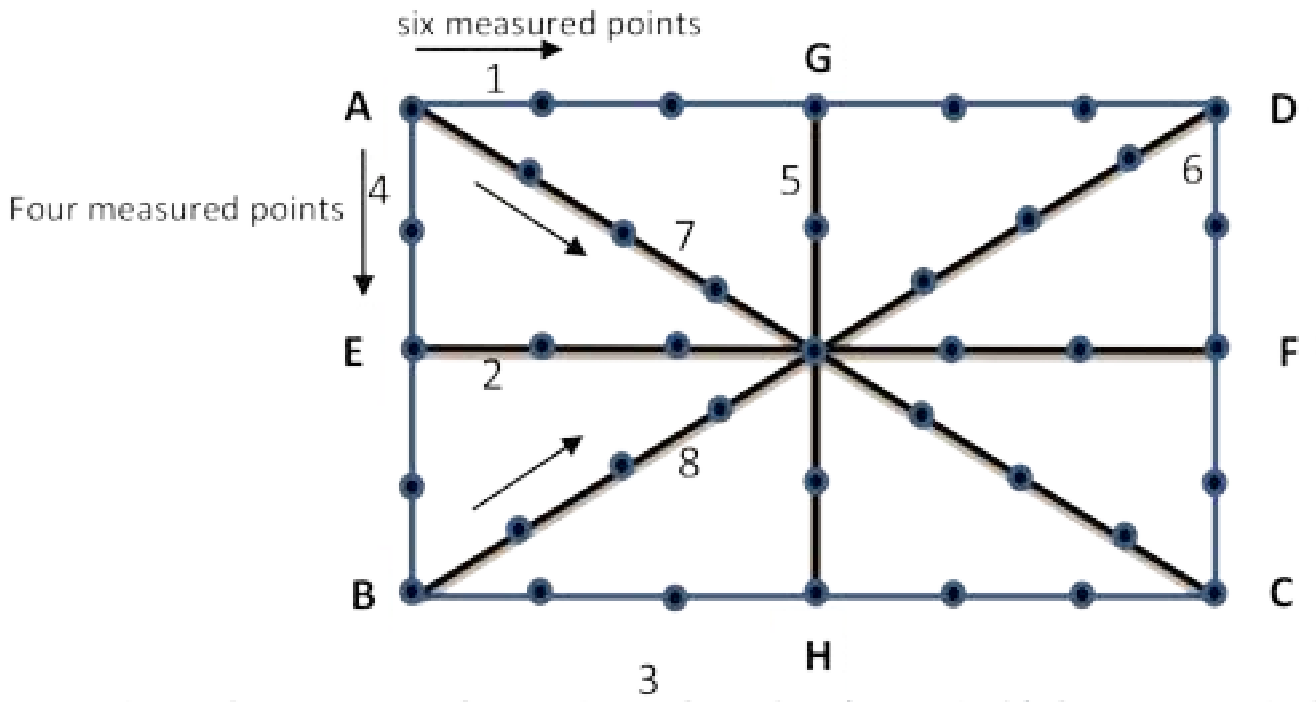

Figure: *Union Jack Test Pattern for granite surface plate (24×36 inch), foot spacer 6 inch.*

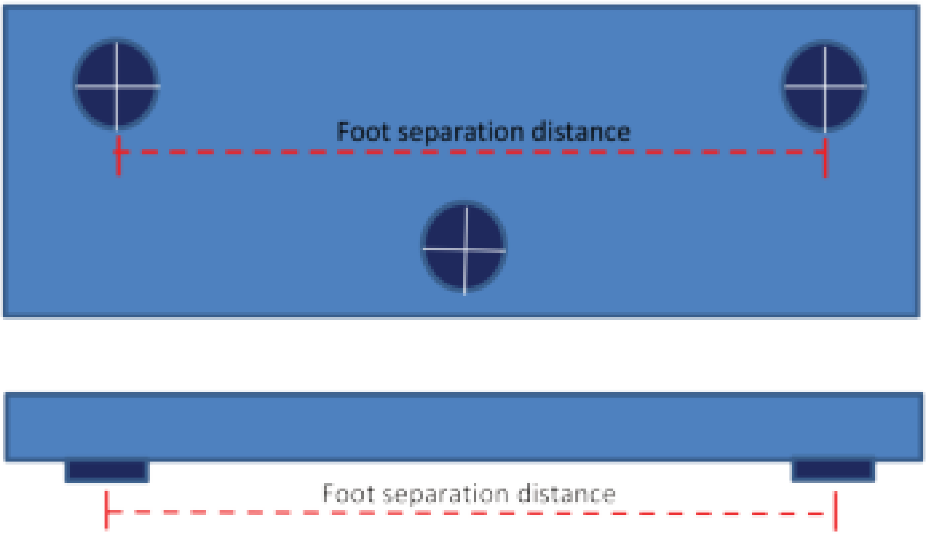

Figure: *Foot Spacer (Elevation and Side view)*

Figure: *Calibration of Surface Plate by laser interferometer system (foot spacers are indicated)*

Biography

Ahmed M. S. El Melegy is a researcher at the Engineering and Surface Metrology Laboratory – National Institute of Standards (NIS) Egypt. He is working in the field of Dimensional Metrology since 2007.

Biological acidification of pig manure using banana peel waste to improve the dissolution of particulate phosphorus: A critical step for maximum phosphorus recovery as struvite

L.B Moyo[1,2], G.S. Simate[1] and T Mutsatsa[2]
[1]University of the Witwatersrand, South Africa
[2]National University of Science and Technology, Zimbabwe

Traditional disposal of agricultural bio-waste such as pig manure and banana peel waste poses an environmental nuisance. The uncontrolled disintegration of these waste materials decomposes to toxic effluent and methane a greenhouse gas twenty-one times more potent than carbon dioxide at trapping heat in the atmosphere, which is detrimental to the climate by elevating temperatures. Agricultural bio-waste is rich in nutrients that include nitrogen and phosphorus. Selectively separating these nutrients from the solid phase to produce high value products has been envisaged as an effective method of waste valorisation. This study aims to investigate the solubilisation of phosphorus (P) during anaerobic digestion (AD) of pig manure with banana peel waste as the co-substrate. The objective was to enhance the biological dissolution of the phosphorus from solid pig manure to the aqueous phase as this is envisaged to subsequently ease the recovery of P as a concentrated product via crystallization. Thereafter, phosphorus is used as a slow-release mineral fertilizer. Biological acidification was effective in reducing the pH to less than 6.50 from an initial pH of 7.28 at higher doses of BPW >100g/L. Maximum dissolution of total phosphorus of 75% was observed at a pH of 5.40. Multiple regression analysis was used to correlate pH, banana peel waste concentration, and the anaerobic digestion time (ADT) to optimize the dissolution of P as this was deduced to be occurring at a low pH. A 2nd order polynomial was deduced to best fit the data with an R2 value of 0.90. The p values for the HRT and banana peel waste concentration were both <0.05 showing that both variables had a strong influence on the pH.

Biography

Langa Bright Moyo is currently a Lecturer at The National University of Science and Technology in the department of Chemical Engineering have been a lecturer for 4 years now specializing in Mass Transfer and Separation processes. He is also a PhD Candidate at the University of the Witwatersrand in South Africa and the presentation he would be doing is a chapter in his PhD thesis on recovering phosphorus from pig manure using ferrochrome slag as a magnesium source. He had worked in the water treatment sector as well in South Africa for a period of 3 years specializing in waste beneficiation.

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Robotic process automation in banking industry: A case study on Deutsche Bank

Alice Saldanha Villar[1] and **Nawaz Khan**[2]

[1]University of Essex, Colchester, United Kingdom

[2]Walden University, Minneapolis, USA

Robotic process automation (RPA) is a software robot technology designed to execute rules-based business processes by mimicking human interactions across multiple applications. As a virtual workforce, this software application has proven valuable to organizations looking to automate repetitive, low-added-value work. The combination of RPA and Artificial Intelligence (AI) is called CRPA (Cognitive Robotic Process Automation) or IPA (Intelligent Process Automation) and has led to the next generation of RPA bots. It has been transforming the banking industry by making the core financial operations exponentially more efficient and allowing banks to tailor services to customers while at the same time improving safety and security. Although intelligent automation is enabling banks to redefine how they work, it has also raised challenges regarding protection of both consumer interests and the stability of the financial system. This article presents a case study on Deutsche Bank's successful implementation of intelligent automation and also discusses the ethical responsibilities and challenges related to automation and employment. We demonstrate how Deutsche Bank successfully automated Adverse Media Screening (AMS), accelerating compliance, increasing adverse media search coverage and drastically reducing false positives. This research contributes to the academic literature on the topic of banking intelligent automation and provides insight into implementation and development.

Biography

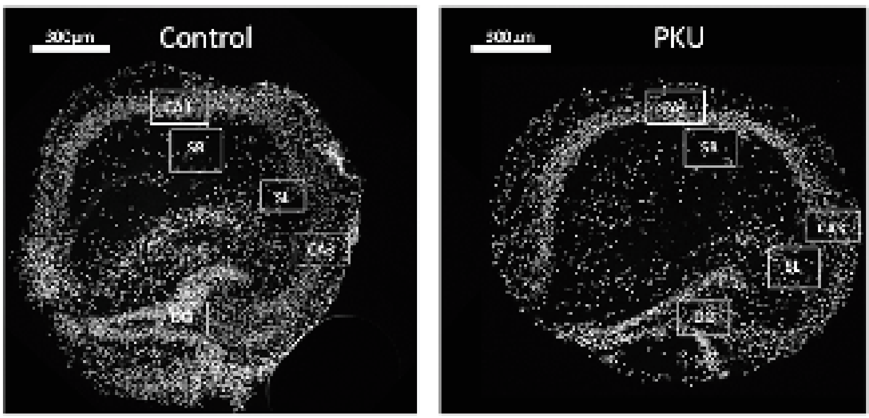
Alice Villar is a Computer Scientist and Lawyer born in Brazil and currently living in Ohio (US). In May, 2021, during her Master's degree studies in Computer Science at the University of Essex Online (UK), she published "Robotic process automation in banking industry: a case study on Deutsche Bank" in Springer Nature (Journal of Banking and Financial Technology). That September, she was invited to be a Validation Panel Member in the course approval for Kaplan Open Learning's MSc Data Science and MSc Artificial Intelligence, evaluating the degree programs in terms of academic content, quality, and fitness for purpose. Her current research interests include AI and ethics and emerging technologies of Industry 4.0, and Industry 5.0. Previously, she authored three law books, including an in-depth analysis of Brazilian Banking Law entitled "Direito Bancário", as well as numerous articles. She is currently a Technical Research Writer at HELPFUL Engineering, Columbus (OH).

A culture model for the assessment of phenylalanine neurotoxicity in phenylketonuria

Julian Kylies and **Bianka Brunne**
University Medical Center Hamburg-Eppendorf, Germany

Objective: Phenylketonuria (PKU) is caused by a specific mutation of the phenylalanine hydroxylase (PAH) gene. The deficiency of PAH results in high phenylalanine levels (Phe), low tyrosine levels (Tyr), and reduced catecholamine neurotransmitters. The majority of PKU patients, if untreated, develop severe mental retardation. The specific contribution of high Phe and low Tyr levels in mental retardation is largely unknown. In this study, we used organic hippocampal slice cultures in an optimized medium as an adequate culture model to decipher the precise role of high Phe and low Tyr levels on synaptic and glial integrity in PKU. The hippocampus is closely related to learning and memory and reduced catecholamine neurotransmitter levels can be neglected since these neurotransmitters do not derive from the hippocampus. Cultures exposed to physiological concentrations of Phe were compared with cultures exposed to doses of Phe/Tyr, as in the cerebral fluid of PKU patients.

Methods: Using capillary western blot analysis and immunohistochemistry, followed by quantitative image analysis, we tested the expression of various pre- and postsynaptic proteins (PSD95, synaptopodin, SNAP25, synaptophysin), glial cell markers (GFAP, Iba1, P2Y12, CD68, C3b), and the morphology of glial cells



Example figures of hippocampal slice cultures showing typical layer arrangement in both control and PKU groups. No change in the structural integrity of the tissue was seen. For synapse analysis, pictures were taken from stratum radiatum (SR) CA1 and stratum lucidum (SL) CA3 hippocampal region. For microglia analysis, pictures were taken from the stratum radiatum (SR) CA1 (DG, dentate gyrus).

Results: We found a downregulation of the postsynaptic protein PSD95 and the presynaptic protein SNAP25 in the presence of high/low Phe/Tyr levels after 3 weeks, which, then however, recovered after 6 weeks in culture. Furthermore, no change in the expression pattern of glial proteins was observed.

Conclusion: Our results show that high Phe levels/low Tyr levels alone are unlikely to substantially contribute to mental retardation in PKU. The direct neurotoxic potency of high Phe/low Tyr concentrations is almost negligible since the effects are transient. The transient character in the presence of unchanged levels of high Phe/low Tyr points to a role of reduced catecholamine derivate neurotransmitters, rather than of high Phe/low Tyr levels in PKU.

Biography

Julian Kylies is a Research assistant at the Institute of Neuroanatomy, University Medical Center Hamburg-Eppendorf.

Education: 10/22 Second Medical Exam, University Medical Center Hamburg-Eppendorf, Germany. 03/20 First Medical Exam (Physikum), University Medical Center Hamburg-Eppendorf, Germany. 11/22 USMLE Step 2CK, passed with 264 points. 08/21 USMLE Step 1, passed with 235 points

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Ethics of human-machine interaction: A proposition

Abeer Dyoub
University of L'Aquila, Italy

Robots in elder care, robot nannies, virtual companions, chatbots, robotic weapons systems, autonomous cars, etc. are examples of some of the Artificial Intelligence (AI) systems currently undergoing research and development. These kinds of systems usually need to engage in complex interactions with humans. To ensure that these systems will not violate the rights of human being and also will carry out only ethical actions (i.e., actions that follow ethical norms of the community in which they are deployed), a combination of AI and ethics has become mandatory. This is the subject for a newly emerging interdisciplinary field known under the name of Machine Ethics.

Biography

Abeer Dyoub is a researcher fellow at the Department of Engineering, Computer Science and Mathematics (DISIM), University of La'Aquila. Her reserch interest focuses on Artificial Intelligence, with special focus on Computational Logic including Intelligent Agents and Multi Agent Systems, Knowledge Representation and Reasoning, Interpretable Machine Learning, and Machine Ethics. She is a fellow of ACM, GRIN, AIxIA, and GULP. She holds a baschelor's degree in electronic engineering from Tishreen University, Syria 2000, a master's degree in computer science 2004 from JMI university, India, and a PhD in ICT from the University of L'Aquila, Italy, 2019.

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Evaluation of structural properties of biodegradable nanoPMOs by STORM imaging for efficient cancer therapy

Pradip Das[1,2], Silvia Pujals[2], Lamiaa M. A. Ali[1], Magali Gary-Bobo[1], Lorenzo Albertazzi[2] and **Jean-Olivier Durand[1]**

[1]University of Montpellier, France
[2]Institute for Bioengineering of Catalonia, Spain

In recent years, various nanomaterial-based drug delivery nanoplatforms have been widely developed in preclinical studies for the potential targeted cancer chemotherapy. However, the advanced microscopic study for better optimization of physicochemical properties of these drug delivery nanoplatforms is not well studied so far which limits their successes in clinical applications. Therefore, superior understandings of the interaction of nanocarrier with different physicochemical properties with biological systems are essential and challenging for improved cancer treatments. In this study, we are focusing on the evaluation of different physicochemical properties such as surface functionality and degradation of periodic mesoporous organosilica nanoparticles (nanoPMOs) by super-resolution STORM technique. For this purpose, we have synthesized a library of redox-responsive antibody-conjugated biodegradable nanoPMOs with controlled size, shape, composition, orientation, and multivalency. The structural properties (i.e. size and shape) of nanoPMOs labeled with STORM-compatible dye are resolved by direct stochastic optical reconstruction microscopy (dSTORM) imaging due to higher spatial resolution compared to conventional microscopy. The degradation of functionalized nanoPMOs induced by elevated concentrations of reduced glutathione that mimic the intracellular reducing environment has been measured qualitatively and quantitatively for the first time using single-molecule localization microscopy (dSTORM). The results show that nanoPMOs properties significantly influence their degradation. To understand the role of multivalency in nanoPMOs targeting cancer cells, we have employed dSTORM imaging to evaluate the surface functionality of nanoPMOs conjugated with antibody in different orientations and multivalency. In addition to physical properties (i.e. size and shape), the surface functionality of nanoPMOs plays a significant role in their cellular uptake process. The outstanding drug loading capability into the mesoporous structure and glutathione-induced rapid drug release behaviour of selective nanoPMOs enable to produce the potent anticancer effects against prostate cancer. Thus, the nanoPMOs with optimized properties have a high potential as drug delivery nanoplatforms in targeted chemotherapy of prostate cancer.

Biography

Pradip Das obtained his B.Sc. (Hons) in 2009 and M.Sc. in 2011 in Chemistry from Vidyasagar University, India, and the Indian Institute of Technology Kharagpur, India, respectively. He received his Ph.D. in Chemistry from Indian Association for the Cultivation of Science, India (degree awarded by Jadavpur University, India) in 2016 under the supervision of Prof. Nikhil R. Jana. He completed his first postdoctoral research with Prof. Ulrich J. Krull from the University of Toronto Mississauga, Canada. Then he joined as a postdoctoral fellow at the University of Milano-Bicocca, Italy, for his second postdoctoral research with Prof. Davide Prosperi. He finished his postdoctoral research with Dr. Teresa Pellegrino at the Italian Institute of Technology Genova, Italy. Nowadays, he is working as a Marie-Curie postdoctoral fellow with Dr. Jean-Olivier Durand at the Institute Charles Gerhardt Montpellier, CNRS, France. He has published 26 papers that have been cited more than 1425 times.

The advanced use of Calphad databases and methods in computational thermodynamics

Bo Sundman
OpenCalphad

Development of new materials is a challenging task which involves not only selecting the final properties but also the whole processing route. Experimental verification is very important but very expensive and to limit the cost and time for the development one regularly uses computer simulations for many steps. For equilibrium calculations the Calphad method provides facilities to calculate phase diagrams but also many other kinds of diagrams providing phase amounts, chemical potentials and heat capacities at varying temperature and compositions. But a very important feature of the assessed Calphad thermodynamic databases is that they provide information about phase amounts, chemical potentials etc also for the metastable states during phase transformations. Combined with Phase Field Methods or other kinetic models the use of validated and assessed thermodynamic databases is essential.

Biography

Bo Sundman is professor emeritus at the Computational Thermodynamics (CT) division in the Materials Science and Engineering (MSE) department of KTH, Royal Institute of Technology in Stockholm, Sweden. He graduated as a master in physics engineering at KTH in 1974, got a PhD in physical metallurgy in 1981, become lecturer at KTH in 1986, assistant professor in 1994 and professor in 2000. After 2006 he has been fully or partially on leave to work in France and other countries. From 2006 to 2009 he was at CIRIMAT at Paul Sabatier University in Toulouse and from 2009 at INSTN, CEA Saclay and together with Dr Constantin Meis arranged a annual summer school on the use of thermodynamic calculations. He retired in 2012 but continued to work part time at INSTN and at the Central South University in Changsha, China.

He published more than 180 papers and have more than 13000 citations (in 2020). He received the Calphad ”Triangle” Award 2002, the Hume-Rothery Award 2005 from IOM3 in UK, a Humboldt senior researcher award from Germany in 2012 and the NIMS Award in Japan 2017. Together with Dr Leo Lukas and Dr Suzana G Fries He written a book ”Computational Thermodynamics, the Calphad Method” published by Cambridge University press in 2007.

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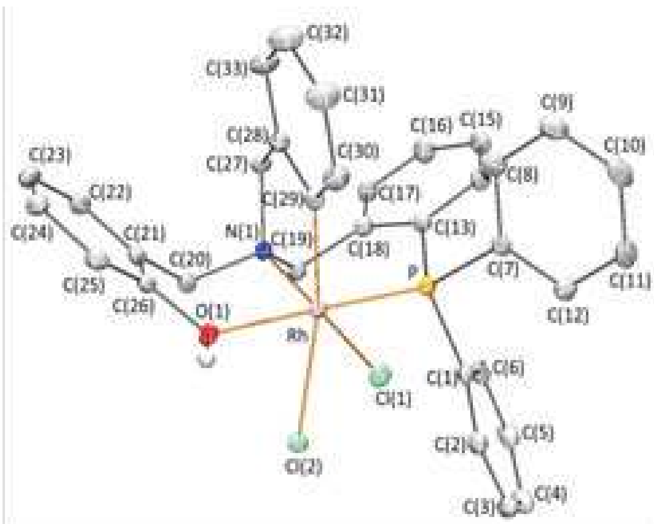
Synthesis of chiral-at-metal rhodium complexes from achiral tripodal tetradentate ligands

R. Rodríguez

Universidad de Zaragoza, Spain

Over some 60 years of asymmetric catalysis, the source of catalyst chirality has mainly been based on chiral organic molecules with stereogenic carbon atoms or chiral molecules exhibiting atropisomerism. However, there is a virtually unexplored option in the design of enantioselective catalysts, where the metal cation of the catalyst is a stereogenic center. In these cases, the metal center can be surrounded by any achiral ligand as long as they lead to metal complexes with the stereogenic metal, commonly called chiral-at-metal complexes. However, few examples of enantioselective catalysts with exclusive metal-centered chirality exhibit a stable configuration.

This work describes the completely diastereoselective synthesis of the chiral complexes $[RhCl_2(\kappa^4\text{-}L)]$ (1) and $[Rh(\kappa^4\text{-}L)(NCMe)_2][SbF\ ]$ (2) containing a new tripodal tetradentate ligand. The resolution of the racemic mixture of 2 has been achieved through kinetic resolution using enantiopure (S)-2-(4-isopropyl-4,5-dihydrooxazol-2-yl)phenol as a chiral auxiliary. The results of catalytic tests on the 1,3-dipolar cycloaddition reaction proving that the chirality is efficiently transferred from the metal to the substrate.



ORTEP view of complex 1

Biography

Ricardo Rodríguez studied chemistry at the University of Zaragoza (Spain) and received his Ph.D. degree in inorganic chemistry from the University of Zaragoza. After postdoctoral research at the Fundamental and Applied Heterochemistry Laboratory-LHFA (Toulouse, France), he started working as a Tenure Track in the Department of Inorganic Chemistry at Chemical Synthesis and Homogeneous Catalysis Institute-ISQCH (Zaragoza, Spain). Since 2021, he has been a Staff Scientist at the Spanish National Research Council-CSIC (Spain). His research is in the fields of metal-centered stereochemistry and transition metal frustrated lewis pairs for catalysis.

Quality of life after extraction of mandibular wisdom teeth: A systematic review

B. CHAMI, L. Hallab and **A. AZZOUZI**
Mohammed V University, Morocco

The extraction of mandibular third molar (MTM) represents the most frequent surgical procedure performed in oral surgery with a percentage of 5 million per year in the United States. Different complications are encountered in the majority of the population in the first days following this extraction such as alveolitis, pain, trismus, edema as well as a difficulty swallowing. These complications might lead to deterioration in the quality of life (QoL) during the immediate postoperative period. QoL can be defined as "a state of well-being" which is based on two components. The first is the ability to perform daily activities that reflect physical, psychological and social well-being. The second is the patient's satisfaction with the level of functioning, control of disease, and treatment-related symptoms.

The objective of this systematic review was to evaluate the impact of MTM extraction on a patient's QoL.

Methods: An electronic search was conducted through September 2021 on MEDLINE database, ScienceDirect, Ebsco, Scopus and Google Scholar to collect sufficient articles relevant to the subject. Data were extracted and analyzed according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) guidelines

Data were extracted from selected studies including study type, sample size and characteristics, duration of the observation after removal of MTM, questionnaire used for evaluation of QoL and the result.

From 107 studies, 40 representing 4990 cases met the inclusion criteria. The QoL was deteriorated but different factors contributed to his improvement. Different instruments have been used in these studies: OHIP-14, OHQoLUK, HRQOL,EQ-5D-3L QOL, and UW-QOL.

The extraction of mandibular wisdom teeth has a negative effect on QoL during the first postoperative days but improved progressively by following the medical instructions given by the dental surgeon.

Biography

Bassima Chami is a Professor of pathology and oral surgery, Former head of department of surgery and oral pathology. Faculty of dental medicine in Rabat Mohamed 5 university Rabat Morocco. She is a Member of the laboratory of biostatistics and methodology in clinical research Faculty of Medicine and Pharmacy of Rabat Morocco. She received University degree in clinical research methods from ISPED University of Bordaux France, University degree in dental care under sedation. She is the author of articles in pathology and oral surgery.

Exploring chitosan as an ecofriendly agent to improve sustainable dyeing properties of cotton fabric dyed with (Opuntia Ficus-Indica L) fruit peel and its UV protection activity

R. Mansour[1,2] and **H. Ben Ali**[3]
[1]*University of Monastir, Tunisia*
[2]*University of Kairouan, Tunisia*
[3]*Laboratory of Materials Chemistry, Tunisia*

This paper explores the use of Chitosan as sustainable agent to improve dyeing properties of cotton fabric dyed with Opuntia ficus-indica L fruit peel and the determination of the amount of anthocyanin pigments by the spectrophotometric method. The results of this study highlights that cotton fabrics treated with chitosan have better depth of shade (K/S = 12) than those untreated fabrics (K/S = 3.7) dyed with Opuntia ficus-indica L fruit peel. We have thoroughly investigated the effects of dye bath pH and temperature on the color properties of the aforementioned fabrics. UV protection of cotton fabrics increased after natural dyeing, and it was further improved after being treated with chitosan. Experimental results show that the fastness properties of dyed cotton fabrics treated with chitosan were improved from average to excellent.

Biography

Rym Mansour is an Assistant Professor in Textile Materials & Engineering. She obtained her diplomat of engineering. in Textile Engineering from Tunisian Engineering college of Monastir. She then worked at High institute of technology of Kairouan as a Textile Engineer, before pursuing a PhD in developing sustainable textile finishing processes using Natural dyes extracted from grape pomace and leaves at the faculty of sciences of Monastir. Following the PhD completion, she became a Research Assistant working on the use of chitosan extracted from crabs to enhance the dyeability of cotton fabtics with natural dyes and exploring their UV-protection. Since joining the high institute of arts and crafts of Kairouan in 2017, she has taught sciences of materials, besides she has come a contact point at European Horizon and at Erasmus+.

Coping with complexity in scientific research by combining systems, qualitative and quantitative approaches

O. S. Donaires

School of Economics, Business Administration and Accounting at Ribeirão Preto, Brazil

The traditional method of science is reductionist in essence. Reductionism imposes severe limits in dealing with the complexity that is proper to some areas of research. To cope with complexity in research, it may be wise to combine different approaches, including systems approaches, qualitative methods and quantitative methods.

Systems approaches can help researchers to cope with structural, behavioral or evolutionary complexity. They allow researchers to develop theoretical frameworks to comprise a broad perspective of a research problem. Theories are systems themselves. A system is a set of elements that interact with each other to meet some declared purpose. Analogously, a theory is a set of constructs related to each other by propositions.

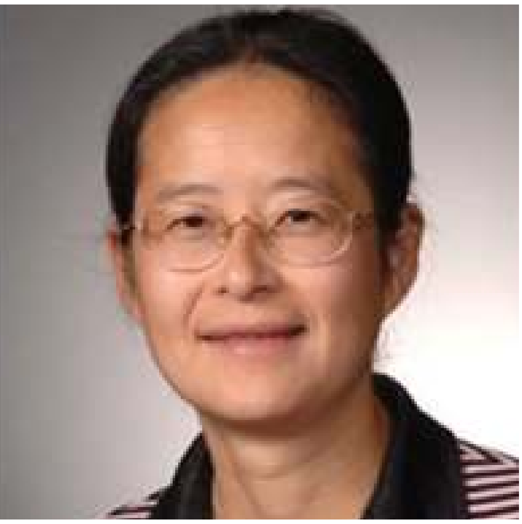
Qualitative methods can help a researcher to gather rich data to support the process of building a theoretical model and to ground theory on data. Quantitative methods contribute the rhetorical power of numbers. Multivariate data analysis methods, for instance, can help researchers to organize big data to support the process of theory building. Researchers can also apply quantitative methods to test and validate theory, by verifying key features of a systemic theoretical model.

Methods must be however consistently combined, based on a solid epistemological approach. This requires a deep understanding of each method and the conditions under which the application of each method is valid, to not violate these conditions as methods are put together.

Some articles illustrate how systems, quantitative and qualitative approaches can be combined to deal with complex research subjects such as the diagnosis of the situation of micro, small and medium enterprises in a city, the analysis of outcomes of sustainable development goals in countries, and sustainable competitive advantage in very dynamic markets.

Biography

Omar Sacilotto Donaires holds a degree in Electrical Engineer and a master's degree in Organizations Management, both from the University of São Paulo. He holds an MBA degree from the University of São Paulo and is PMP®, Project Manager Professional, certified by the PMI®. He has professional experience in industry at research and development, new product development, project management, development of software for process automation. His research interests include software engineering, new product development, project management, systems approach, sustainable development and dynamic capabilities.



BIOGRAPHY

Lili Wang is Senior Research Scientist and Manager at the Biosystems and Biomaterials Division of NIST. She is a leading expert in quantitative flow cytometry critical for diagnostics and advanced therapeutic development. She serves as the Lead Manager for the NIST Flow Cytometry Standards Consortium, a major Public-Private Partnership with key stakeholders from other agencies, industry, and academia, where she and her team works with consortium members to address pressing measurement and standards needed for bioassays, including SARS-CoV-2 antibody testing for diagnostics, vaccine testing, surveillance. In collaboration with WHO, her team has established multiple standards and reference materials, including critical reference materials for HIV/AIDS monitoring, stem cell counting for blood transplantation, and most recently, the first international serology/antibody standard. She serves on multiple professional committees and published over 120 peer-reviewed articles. She is a recipient of the 2020 and 2021 US Department of Commerce Gold Medal.

Lili Wang
National Institute of Standards and Technology (NIST), USA

Development of B-cell reference naterials for comparable and quantitative cytometric expression analysis

Objectives: Cell-based therapies have emerged as a novel approach to treat cancer and other conditions. Several studies highlighted the crucial role of quantifying surface CD19 using flow cytometry in providing guidance for proper selection of targeted Immunotherapy in B- cell malignancies. However, the lack of adequate reference materials and the complexity of the cytometer instrumentation have resulted in few reference standards to ensure comparable and quantitative CD19 expression analysis. This study was designed to evaluate CD19 expression in potential biological cell reference materials and provide an assessment of their suitability to support the development of CD19 reference standards.

Methods: CD19 expression measurements were made using QuantiBrite PE and CD4 based quantification schemes. Additionally, CD19 expression on a selected human peripheral blood mononuclear cells (PBMC) was evaluated using mass cytometry to verify result comparability between two orthogonal measurement techniques. Three commercial PBMC-A, PBMC-B, and PBMC-C made by three different manufacturers and one synthetic CD19 B cell material were tested. Variables potentially contributing to the differences in CD19 expression, PBMC manufacturing process, number of healthy donors used for each PBMC lot, antibody reagent, operators, and experimental days were considered in the evaluation.

Results & Conclusions: Mean of CD19 ABC (antibodies bound per cell) is 7700 with a range from 4700 to 11300 at a 95% confidence level was obtained for PBMC-A, 10900 with a range from 7400 to 14900 for PBMC-B, and 14000 with a range from 7200 to 22000 for PBMC-C.

Full understanding of the sources of uncertainty, their relative contributions and areas of improvement will lead to production of high-quality and robust reference material for quantitative expression measurement for many application fields not limited to flow cytometry.

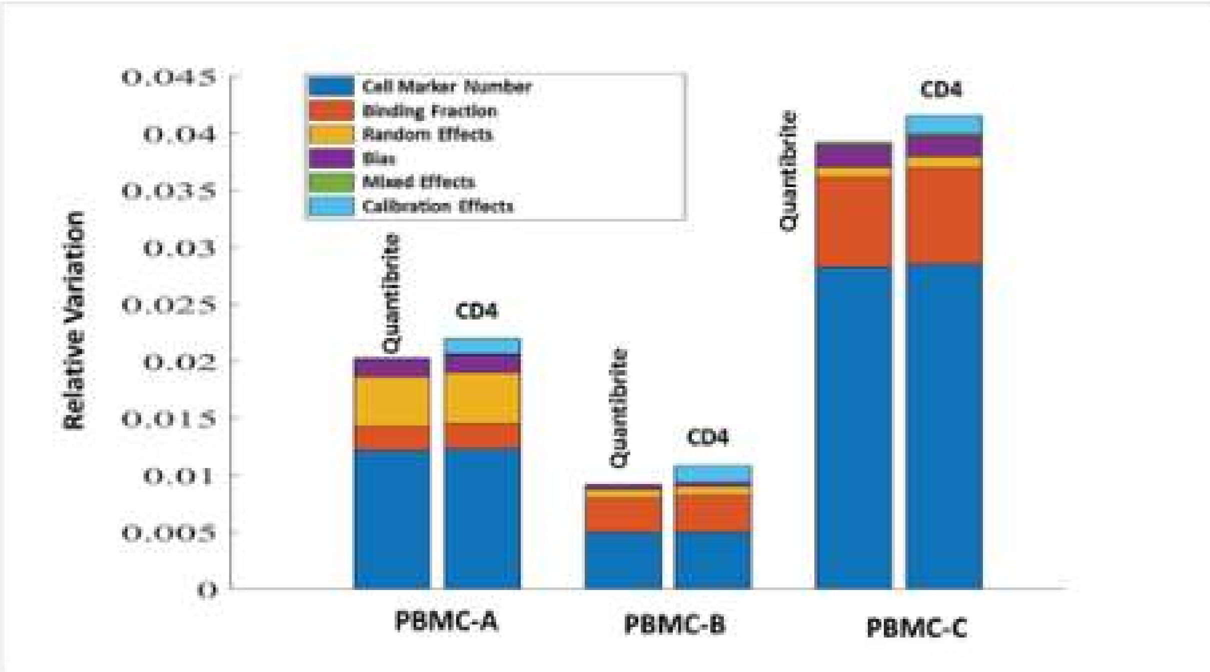


Figure: Relative variation contribution from each colored source of uncertainty for each PBMC preparation.

BIOGRAPHY

González Olvera obtained both master's and doctoral degrees in Advanced Technology from the Research Center in Applied Science and Advanced Technology, Instituto Politécnico Nacional (Querétaro, Mexico), with a major in Biotechnology. During his doctoral work, he carried out a stay in the Central European Institute of Technology (CEITEC), Brno, Czech Republic, in which the protonation dynamics of short DNA chains was studied by NMR. Additionally, he has experience on spectroscopic techniques for the analysis of biomolecules, such as UV spectrophotometry, HPLC coupled to different detectors (diodes array, mass spectrometer, etc) and NMR. Today working as researcher professor at the Universidad Politécnica de Santa Rosa Jáuregui (Querétaro, Mexico), with research interest on Bionanotechnology, applied spectroscopy, experimental and computational biomolecules physics, reporting corresponding results in related international journals and congress.

J. C. González-Olvera
Universidad Politécnica de Santa Rosa Jáuregui, Mexico

Nanostructured materials templated on short DNA oligonucleotides, at different pH conditions

Deoxyribonucleic acid (DNA) is the biopolymer responsible to contain the sequence information for the polypeptide synthesis in living organisms. However, because of its physicochemical and molecular recognition properties, this macromolecule has been considered to produce a wide variety of nanostructured materials. Depending on the size and sequence of the molecule, single- and double-stranded DNA is able to template the aggregation of different chemical species in solution, followed by a chemical reaction to crystallize nanostructures of various topologies and sizes. Particularly, short single-stranded DNA (ssDNA) oligonucleotides (small molecules 8-50 nucleotides) in aqueous solutions, at different pH values, ionic strength, and low temperature (4°C), have templated the formation of metallic nanoparticles (silver, zinc and copper), exhibiting diverse structure dimensions and geometries produced by distinct synthesis process. This DNA-guided crystalization is based on the acid-base ionization of the heterocyclic bases, and the subsequent electrostatic aggregation of counterions around the formed electrically-charged sites in the chain, also affected by the nearest-neighbours base stacking. Accordingly, molecular ions and small polar compounds have been assayed to obtain nanostructures on these ionized short ssDNA, at different pH media, and even bound to substrates such as microcrystalline cellulose and starch. Preliminary results suggest the formation of nanostructures on short DNA homo-oligomers (identical monomer units), either in aqueous solution or attached to polysaccharides, attributable to clear shifts in the corresponding UV absorption spectra of ssDNA, with topologies and size of the nanostructures remaining pending. This alternative method to produce DNA-based nanostructures may have interesting applications in the field of Bionanotechnology, due to to the modularity of the short ssDNA, even coupled to other materials or DNA origamis

XRD-Results measured on fracture surfaces of austenitic tensile test specimen

Karl Berreth[1] and **Thorsten Michler**[2]
[1]Materialprüfungsanstalt Universität Stuttgart, Germany
[2]Fraunhofer, Freiburg, Germany

The fraction of α'-Martensite was measured on fracture surfaces of ten commercial austenitic stainless steels of different austenite stability by quantitative X-ray diffraction (XRD). Due to austenitic steels tend to transform partially to α'-Martensite upon straining as under tensile testing. Due to the influence of pressurized hydrogen the partition of α'-Martensite divers from steel to steel, when tensile tested in hydrogen compared to specimen tested in helium atmosphere. The formation of α'-martensite may help to result in hydrogen assisted crack initiation and propagation. For a given steel, α'-martensite contents on fracture surfaces of specimens tested in helium were higher compared to those tested in hydrogen and tensile reduction of area of the specimens tested in hydrogen decreases with increasing martensite content on the fracture surface. The relative reduction of area RRA is presented.

***Table 1:** XRD Results*

Steel	grade	atm.	α{1 1 0}	α{2 0 0}	α{2 1 1}	γ{1 1 1}	γ{2 0 0}	γ{2 2 0}	α'-martensite	γ-austenite	Ni content	RA
			counts	counts	counts	counts	counts	counts	vol %	vol %	%	%
X2CrNiMoN18-14-3	316LN	He	7,66	0	0	126,15	63,49	159,89	0,94	99,06	13,2	82
X2CrNiMoN18-14-3	316LN	H2	9,36	0	1,47	149,06	52,97	141,79	1,38	98,62	13,2	81
X10CrNiNb18-9 (A)	347	He	81,58	9,57	28,31	106,49	46,75	131,42	16,37	83,63	11,3	63
X10CrNiNb18-9 (A)	347	H2	61,69	4,89	16,69	122,37	49,08	120,87	11,83	88,17	11,3	59
X10CrNiTi18-9 (C)	321	He	41,26	0	4,36	160,48	49,75	149,88	5,37	94,63	11,5	74
X10CrNiTi18-9 (C)	321	H2	38,26	0,17	3,35	147,6	47,67	124,32	5,64	94,36	11,5	65
X2CrNiMo17-13-2	TP316NG	He	46,26	4,05	7,1	127,1	50,21	113,9	8,77	91,23	10,4	85
X2CrNiMo17-13-2	TP316NG	H2	37,08	3,88	8,49	106,49	46,32	129,24	7,61	92,39	10,4	72
X2CrNi19-11	304L	He	50,35	3,38	14,97	120,66	58,96	121,89	9,54	90,46	11,2	73
X2CrNi19-11	304L	H2	38,15	5,94	9,73	101,55	57,43	138,32	7,98	92,02	11,2	61
X2CrNi18-10	TP304L	He	62,88	6,43	15,42	134,37	49,94	116,73	12,13	87,87	11	83
X2CrNi18-10	TP304L	H2	52,91	10,11	22,96	91,97	51,8	116,31	13,78	86,22	11	64
X2CrNi18-9	304	He	38,15	0,78	5,79	117,17	51,91	141,37	5,95	94,05	9,9	81
X2CrNi18-9	304	H2	50,93	0	6,68	169,44	43,11	129,26	7,21	92,79	9,9	61
X6CrNiNb18-10 (B)	347	He	63,22	9,13	19,3	147,93	49,25	91,42	14,34	85,66	10,6	60
X6CrNiNb18-10 (B)	347	H2	87,2	17,09	45,24	94,58	34,39	100,25	24,30	75,70	10,6	38
X10CrNiTi18-9 (D)	321	He	270,2	69,56	184,71	42,5	14,28	41,05	73,08	26,92	9,3	68
X10CrNiTi18-9 (D)	321	H2	186,11	20,84	57,72	135,89	39,01	74,08	35,79	64,21	9,3	39
X2CrNiN18-10	304LN	He	95,47	16,55	48,33	86,64	44,05	133,54	21,90	78,10	9,6	77
X2CrNiN18-10	304LN	H2	46,18	3,26	11,07	132,82	59,86	114,68	8,59	91,41	9,6	44

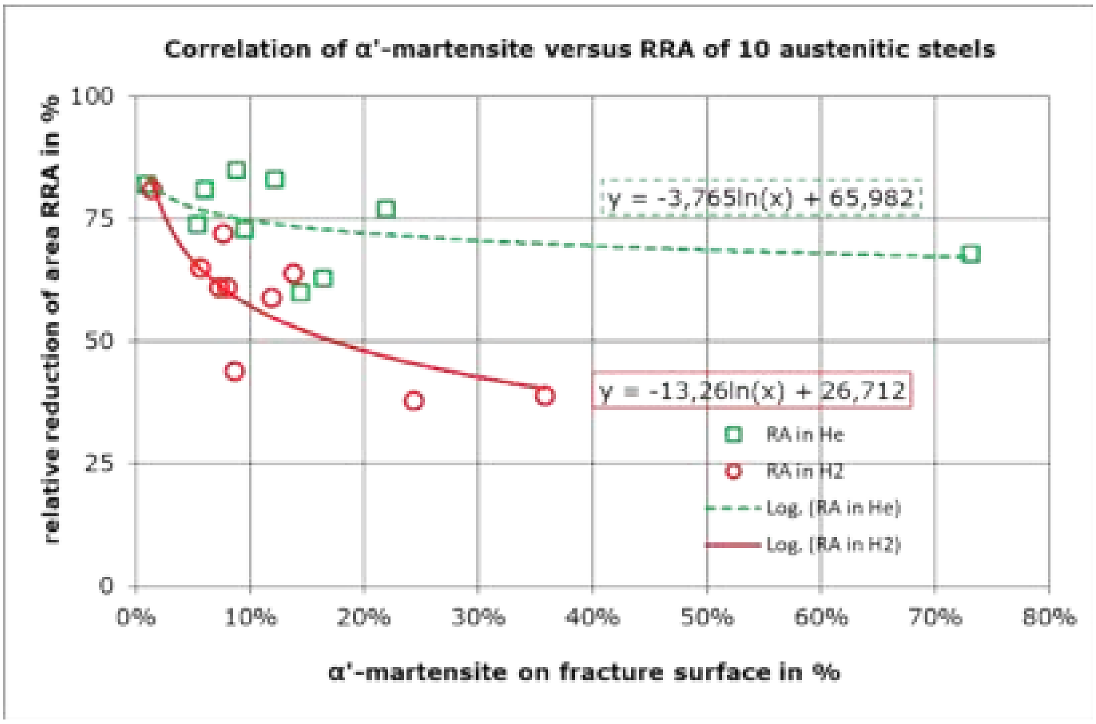


Figure: *Relative reduction of area versus fraction of α'-martensite*

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ADV. MATERIALS SCIENCE 2023

Solar temperature variations computed from SORCE SIM irradiances observed during 2003-2020

R. Cahalan[1] and **P. Ajiquichi**[2]
[1]NASA Goddard Space Flight Center, USA
[2]Universidad Autónoma de San Luis Potosí, Mexico

For a "reference day" of minimal solar activity between solar cycles 23 and 24 we compute the brightness temperature from solar spectral irradiance for each wavelength. We consider small variations of irradiance and temperature about the reference day values, and derive linear and quadratic analytic temperature approximations by Taylor expansion about the reference values. To determine approximation accuracy we compare to exact brightness temperatures computed for each day. We find that the linear analytic approximation overestimates, while the quadratic underestimates the exact result. Using R software, we find statistical fit models with minimum root-mean-square-error. We show that the quadratic statistical fit models give the smallest root-mean-square-error, giving results very near the exact.

To drill or not to drill? - Creep of an oxide-oxide composite with diamond-drilled effusion holes at elevated temperature

M. B. Ruggles-Wrenn and **M. L. Harkins**
Air Force Institute of Technology, USA

Ceramic matrix composites (CMCs) are prime candidates for use in aircraft engines. Yet even with their high-temperature capabilities, many CMC components will need cooling. External or film cooling technique of a component requires rows of small holes within the component surface. Effects of multiple small holes on tensile stress-strain and tensile creep performance of an oxide-oxide CMC consisting of Nextel 720 alumina-mullite fibers in a porous alumina matrix were evaluated at 1200°C. Test specimens included 17 holes with a 0.5-mm diameter in the gage section. The holes were precision drilled using diamond coated drill bits. The presence of diamond-drilled holes noticeably degraded tensile strength and modulus. Specimens with diamond-drilled effusion holes were creep tested at 1200°C in air and in steam. Creep stresses ranged from 40 to 130 MPa. Creep run-out was set to 100 h. The presence of diamond drilled holes degraded creep performance of the CMC as evidenced by higher steady-state creep strain rates and reduced creep lifetimes. An earlier study at the Air Force Institute of Technology considered the effects of small holes drilled using a CO_2 laser on the tensile properties and tensile creep resistance of this CMC. Geometry of test specimens and test conditions were the same as in the present effort. The earlier study found that the presence of rows of small laser drilled holes also considerably lowered the creep resistance of the Nextel720/alumina CMC. In both cases the reduction in tensile strength and creep resistance are due to damage caused to composite microstructure by fabrication of the holes, i. e. drilling. However, different hole drilling techniques result in different microstructure degradation mechanisms. Damage to the CMC microstructure caused by these two drilling techniques and implications for mechanical performance and durability are discussed.

A human immune system (HIS)-Humanized mouse model for infectious diseases

Teodor-D. Brumeanu[1], **Karim F.A**[2] and **Sofia A. Casares**[1,2]

[1]*Uniformed Services University, USA*

[2]*Naval Medical Research Center, USA*

We have previously reported a human immune system-humanized mouse (HIS-DRAGA mouse: HLA-A2.HLA-DR4.Rag1KO.IL-2RγcKO.NOD) that by virtue of weak irradiation and infusion with pluripotent CD34+ human hematopoietic stem cells sorted from human umbilical cord blood can reconstitute a long-live, functional human immune system in the absence of the murine immune system. The mouse also expresses naturally the human ACE2 main receptor for SARS-2 virus on several tissue organs including the lungs epi/endothelia.

The HIS-DRAGA mouse was shown to function as a surrogate in vivo human model for infection with HIV, Malaria protozoan, ZIKA, Scrub typhus, Influenza type A heterotypes, and recently for COVID-19. Infected mice are able to (i) mount virus-specific human antibodies and lung-resident CD4 and CD8 T cells, (2) T follicular cells, (iii) human-like immunopathology, and it has been recently used as a platform for generation of cross-neutralizing "fully' human monoclonal antibodies to Influenza type A heterotypes and SARS-2 variants of concern. Besides the unique advantages of this mouse strain for studying the mechanisms of infection and host-pathogen interactions, tissue-specific human-like immunopathology and human immune responses at different stages of infection, it can also be also utilized for testing the safety and efficacy of candidate vaccine prototypes and therapeutics for infectious diseases.

Reversing atmospheric carbon dioxide concentrations by the sequestration of organic carbon in the abyss

Frederick W. MacDougall
Deep Ocean Carbon Storage

This paper describes a method of reducing atmospheric carbon dioxide (CO_2) levels. The method mimics the Azolla Event that started 59 million years ago and was instrumental in decreasing "Hothouse Earth's" ambient temperature from the Paleocene Eocene Thermal Maximum (PETM) that occurred 58 million years ago, by ≈6°C. A carbon layer from that event can be found in the ocean's abyss today. While the planet is too cool for azolla (aka Duckweed) to do it again, we can capture CO_2 in the same way and store the carbon in the ocean's abyss using the Deep Ocean Carbon Storage (DOCS) system described herein. The operation would be massive involving 150,000 cubic meters of organic matter a day which represents about 1/12 of Earth's dead organic matter. If the planet is held at carbon dioxide net zero with today's consumption of fossil fuel, the carbon storage in the deep oceans will increase by about 3% a century, and there is a lot of room down there.

The DOCS effort includes a deep ocean hydrous pyrolysis system powered by geothermal energy capable of the decomposition of household plastics and other compounds in chambers of superheated water on the sea floor. The same system is expected to be able to breakdown smaller quantities of "forever chemicals", per- and polyfluorinated alkyl substances (PFAS) in supercritical water hydrous pyrolysis.

While the increase in atmospheric CO_2 concentrations and the extended growing seasons caused by Global Warming have increased organic matter production, drought and desertification continue to be a problem. In support of the organic matter needed, the DOCS operation includes two methods of initiating rainclouds.

Advancing university generated biomaterial technology platforms: Our approach and lessons learned in the College of Agricultural Sciences at Penn State

Mark A. Gagnon
University Park, USA

Cellular agriculture, anaerobic digestion (AD), and radio frequency (RF) heat treatment of wood are three biomaterial technology platforms that are being developed technologically and commercially. Technological and commercial developments will be shared along with our approach to cultivating productive industry relationships that bolster commercial adoption. Attendees will be provided with an inside view of our approach, best practices, and lessons learned.

Cellular agriculture is an emerging field of research at Penn State in which products, traditionally derived from animals, are created instead through a biotechnological cell-culturing process. Cell-cultured meat production requires animal cells to be cultured and proliferated in an in-vitro environment, assembled on a scaffold, and fed a serum to promote growth in a bioreactor. Researchers at Penn State have focused on cellular ag scaffold structure, fermentation, economic, and sociological aspects.

Anaerobic digestion research and practice shows promise in North America. Researchers at Penn State, Iowa State and Roeslein Alternative Energy have made significant progress in AD technology optimization, feedstock, and desired energy and biomaterials outputs (Schulte-Moore, et al., 2022).

Dielectric heating (DH) uses electromagnetic field energy applied by RF heating. In this application, wood is heated by long length, alternating, radio waves within a chamber to activate the polarity of water molecules within the wood fiber. The technology is being developed by Penn State, USDA-APHIS, and RF-Kiln Tech to mitigate invasive insects in wooden packaging. Current findings indicate that the technology has significant efficacy and commercial promise (Janowiak, et. al., 2002).

Industry engagement is vital to the success of these projects, and we have learned that research teams should incorporate various adoption lenses into the process along with cogenerating appreciative views of academic, industry, and government sponsor objectives. Specifically, the themes of urgency, agency, knowledge dissemination, research priorities, thoroughness, and research justification will be discussed.

Understanding chare effects on marked ball wear rates – A corrosion study

J. Bailey Fletcher and **Michael S. Moats**
Missouri University of Science and Technology, USA

The performance of grinding media in ball mills can be misrepresented in marked ball wear tests due to galvanic interactions between dissimilar media. The possible galvanic interaction of media materials during marked ball wear tests has not been adequately explored. Corrosion rates and potentials of modern high carbon steel (HCS) and high chromium white iron (HCWI) grinding media materials were measured using electrochemical testing as a function of pH and chloride content in a simulated mill water. The results replicate previous research with the high chromium white iron sample being more noble (higher corrosion potential) and corrosion resistant (smaller corrosion current) than high carbon steel. Using the experimental data (potentiodynamic scans) and corrosion theory, the effects of galvanic coupling on corrosion rates were calculated to examine what could happen during a marked ball wear test or when a mixed media charge is present. This analysis indicates that high carbon steel can cathodically protect high chromium white iron leading to significant decreases in the corrosion rate (up to 99%) of this material during marked ball wear tests. The magnitude of the protection is a function of the pH of the mill water. Understanding how the dissimilar media interact with each other can aid in the media selection process and prevent costly mistakes.

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Investigations into interdiffusion in Fe-Ni-Co-Cr quaternary and Fe-Ni-Co-Cr-Mn quinary high entropy alloys

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[2]*University of California Irvine, USA*

Currently, investigation of the interdiffusion behaviour in the multicomponent systems is most challenging task for the diffusion community. This is due to the lack of a proper experimental technique, which is why the interdiffusion coefficients in quaternary and higher order systems has been absent in the literature. In a multicomponent system, the interdiffusion flux of a component depends not only on its own concentration gradient but also on the gradients of the other components. Such cross effects are called diffusional interactions. Although the diffusional interactions are important in the context to multicomponent systems, literature suggests that these terms are either completely ignored or given least importance while studying the multicomponent diffusion. As most of the materials which are in the current applications are multicomponent in nature, understanding of interdiffusion behaviour in the multicomponent systems is of utmost importance. In the present talk, interdiffusion coefficients determined at 1000ºC in Fe-Ni-Co-Cr and Fe-Ni-Co-Cr-Mn systems based on the two techniques i.e., body diagonal diffusion couple approach and square root diffusivity analysis will be discussed. Strong diffusional interactions have been observed in terms of the large values of the cross interdiffusion coefficients compared with the respective main interdiffusion coefficients. $\tilde{D}_{NiCo}^{Cr}$ and $\tilde{D}_{CoNi}^{Cr}$ were both found to be positive and, 54.5-66.7% and 30-50% of the respective main coefficients in the case of quaternary Fe-Ni-Co-Cr system. $\tilde{D}_{FeNi}^{Cr}$ and $\tilde{D}_{FeCo}^{Cr}$ were found to be positive and, 74.5-85.2% and 50.9-59% of the main coefficient whereas $\tilde{D}_{NiMn}^{Cr}$ was found to be negative and 57.5-63.6% of the main coefficient in the case of quinary Fe-Ni-Co-Cr-Mn system. Successful application of both the approaches in these systems indicate that the interdiffusion coefficients are fairly constant over a large composition range along with the strong diffusional interactions in the two studied systems.

Spray drying process optimization: Drought resistant variety (W82) soymilk powder using response surface methodology (RSM)

Singh P, Bilyeu L and **Krishnaswamy K**
University of Missouri, USA

Drought-tolerated The Williams 82 (W82) soybean variety was developed to increase the soybean production yield, which is adversely affected by biotic stress. This study explores developing W82 soymilk powder using spray drying technology to address the needs of the booming plant-based food sector. The processing parameters and powder properties were optimized using the Central Composite Design (CCD)-Response Surface Methodology (RSM). The spray drying parameters such as outlet temperature (OT) (°C), run time (min) and thermal efficiency (%) were optimized based on the experimental data. Spray dried powder yield (%), pH, color value (L*, delta E & chroma), flowability, water activity, wetting time (min), pH, viscosity, water solubility index (%), water absorption index, particle, rheological, and thermal properties were analyzed. Based on the experimental data and RSM optimization, best combinations of spray dried W82 soymilk powder were obtained at 140°C Inlet Temperature (IT), 35 m3/h (90%) aspirator, and 5 mL/min (15%) feed rate (FR). All the optimizing parameters and results were validated by regression analysis model fit data using p value (0.05), R^2 value (>0.90), and desirability value (>0.5). Based on the experimental data and RSM graphical representation, the best combination of spray dried W82 soymilk powder was obtained at 140°C inlet temperature, 90% aspirator, and 15% feed rate. All the optimized parameters and results were validated by regression analysis model fit data. At optimized processing variables, the desirability function for spray drying parameters, color value, pH, flowability, and powder reconstitution properties increased by more than 50%. This data will be helpful to food processors and food industries to improve product quality (reducing waste), improve thermal efficiency (supporting system sustainability), and enhance the shelf life of W82 soymilk powder.

Development and applications of biomaterials in additive manufacturing processes for personalized bone implants

Patricio-Moncayo Freddy Patrio[1], **Vázquez-Silva Efrén**[1], **Torres-Jara Paúl Bolívar**[1], **Peña-Tapia Pablo Gerardo**[2], **Abad-Farfán Gabriela**[1], **Moya-Loaiza Diana Patricia**[1] and **Andrade-Galarza Andrés Fernando**[2]

[1]*Universidad Politécnica Salesiana, Ecuador*

[2]*Instituto del Cáncer (SOLCA-Cuenca), Ecuador*

The unstoppable progress that biomedicine has experienced in recent decades would not have been possible without the concurrent contribution of new technologies. Scientific research, development and technological innovation in biomedicine, which today are fundamental instruments for the study of medical devices.

The research line of the Group in New Materials and Transformation Processes (GIMAT), from the Salesian Polytechnic University, presents the development of a comprehensive methodology for the design of personalized bone implants that includes biomaterials, virtual simulation and minimally invasive surgical planning, through the three-dimensional reconstruction of anatomical structures from tomographic imaging studies of a patient.

The applied methodology has made it possible to carry out all the analysis and simulation of the surgery necessary to restore some affected bone structure in patients who have suffered some trauma or have suffered some oncological disease with bone involvement.

A summary of the cases treated is presented, the needs of each one in terms of medical devices and the solutions provided.

Gamification as a promoting tool of motivation for creating sustainable higher education institutions

Johanna Andrea Navarro-Espinosa[1], Manuel Vaquero-Abellán[2], Alberto-Jesús Perea-Moreno[2], Gerardo Pedrós-Pérez[2], Maria del Pilar Martínez-Jiménez[2] and **Pilar Aparicio-Martínez[2]**

[1]Universidad ECOTEC, Ecuador

[2]Universidad de Córdoba, Spain

Higher Educational Institutions (HEIs) are responsible for creating healthy and sustainable environments for students and teachers through diverse educational paradigms such as gamification. Education for sustainability focuses on providing skills and abilities to citizens, to achieve sustainable societies in the long term. In this sense, the Healthy People 2030 and the Sustainable Development Goals indicated the imperative to provide inclusive and equitable quality education to promote a healthy environment and life. The principal objective was to analyse the impact of gamification on health development in HEIs, highlighting their positive and negative effects. To achieve such an objective, a bibliometric analysis was carried out. The 257 documents showed no significant increasing trend in the last decade ($p > 0.05$) related to the pandemic. Most of the publications were conferences (45%), and the few published articles were the documents with more citations ($p < 0.001$). According to their index in Journal Citation Reports, there were significant differences between the citations of articles published in journals ($p < 0.001$). The analysis of journal co-citations showed that the leading journals (such as Computers in Human Behavior) had a significant part in the clusters formed ($p < 0.001$), conditioning also the keywords, especially the term "motivation". These findings were discussed, concluding that the experimental studies focused on the teachers' adverse effects are yet to come.

Physical, functional and sensory properties of bitter chocolates with incorporation of high nutritional value flours

Luz Quispe-Sanchez[1], **Marilu Mestanza**[1], **Malluri Goñas**[1], **Elizabeth Renee Ambler Gill**[1,2], **Manuel Oliva-Cruz**[1] and **Segundo G. Chavez**[1]

[1]*Universidad Nacional Toribio Rodríguez de Mendoza de Amazonas, Peru*

[2]*University of New Hampshire, USA*

Due to the growing demand for healthy food products, the industry is seeking to incorporate inputs with high nutritional potential to traditional products. The objective of this research was to evaluate the effect of incorporating Lepidium meyenii, Chenopodium pallidicaule, Amaranthus caudatus, Sesamum indicum and Salvia hispanica flours on the physical, chemical, rheological, textural and thermal characteristics, and the degree of sensory acceptance of dark chocolate bars (65% cocoa). To this end, chocolate bars were made with the incorporation of five flours in four doses (1, 2, 3 and 4%), obtaining 20 different formulations compared with a control treatment (without flour addition). It was found that as flour incorporation levels increased, viscosity, antioxidants and particle size of the chocolates increased, but hardness and pH decreased. The addition of the flours also affected the acceptability and microstructure of the chocolate bars. The incorporation of up to 4% of the flours studied improved the degree of acceptance of the chocolates. Consequently, the incorporation of grain flours with high nutritional value can enhance the characteristics of dark chocolates, becoming a technological alternative for the chocolate industry.

Quality control of drinking water in the city of Ilave, Region of Puno, Peru

Pompeyo Ferro[1], **Luis Jhordan Rossel- Bernedo**[2], **Ana Lucia Ferro-Gonzale**[3] and **Ivone Vaz-Moreira**[4]

[1]*Universidad Nacional Intercultural Fabiola Salazar Leguia de Bagua, Peru*

[2]*Bio Proyect Laboratorio Clinico - Sucursal Medicentro, Peru*

[3]*Universidad Nacional de Juliaca, Peru*

[4]*Universidade Católica Portuguesa, Peru*

The region of Puno, in Peru, is described as a region with some health conditions that may be associated to the water quality, as a high index of anemia or cases of acute diarrhea in children. This study aimed at monitoring the drinking water quality of the city of Ilave, in the Region of Puno, Peru, and to determine possible correlation between physical-chemical and microbiological parameters and the water distribution conditions, as the period of water availability.

Physical chemical parameters (turbidity, residual chlorine, temperature, conductivity, and pH), microbiological parameters (total coliforms, fecal coliforms, and E. coli), and heavy metals (Zn, Mn, Ni, Fe, and Cu) were determined. All the physical chemical parameters and heavy metals quantified were within the maximum permissible limits according to Peruvian regulations, with the exception of residual chlorine, which was for all the samples below the recommended value of 0.5 mg/L. Coliforms that should be absent from drinking water were detected in all the household samples. These results demonstrate the need for the inclusion of additional steps of re-chlorination along the distribution system that guarantee the maintenance of residual levels of chlorine that assure the microbiological quality of the water. The quality of the drinking water was not observed to correlate with the period of water availability.

Complex permitivity method to determine the devitrification process in a glassy matrix. The correlation between the a.c. electrical behavior and the non-isothermal nucleation

Marisa A. Frechero
Instituto de Química del Sur INQUISUR UNS-CONICET, Argentina

It is still not clear how to design a glass from its components to fully predict behavior. We could have an initial idea but by empirical comparison rather than by a formal model to support it. Fewest is what we know about glass stability and how atoms spatial order changes the original glass structure and be altered by perturbations to which it may be subjected over time is almost only empirical. The so-called structural relaxation arises from glass atoms rearrangements close to the glass transition as well as from the devitrification process and it is fundamental to understand these phenomena.

Glass-ceramic materials require a strict control of the crystallization phenomenon [1-3] and their properties depend on the processes that take place during their transformation from a glass-forming liquid or a glass parent. Non-isothermal analysis involves a quick determination and the theoretical basis for the phase-transformation kinetics are also related to the Johnson–Mehl–Avrami–Kolomogoroff model, which describes the isothermal crystallization processes. As no foreign particles are included in a homogeneous nucleation mechanism the homogeneous nucleation and crystallizations show a straightforward effect on its complex permittivity in a more sensitive way that a calorimetric scanning. In this talk, it is explained the relationship between the glass electrical behavior and the thermal devitrification phenomena. How the aging changes the electrical response through the dc conductivity -macroscopic electrical response, and ac permittivity -microscopic response. A fundamental knowledge to use such materials for capacitors.

Shannon entropy analysis of MRI versus FFPE histology for injection medicalization laryngoplasty biomaterials identifies unexpected tissue protective/ regenerating benefit for jellyfish collagen

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Despite recent advances in digital imaging, formalin-fixed paraffin-embedded histology (FFPE-H) remains the "gold standard" in many diagnostic applications. However, FFPE-H can only be performed ex vivo, it destroys the tissue of interest, and is not an option for follow-up corrective surgery, such as injection medialization laryngology (IL). By contrast, MRI enables native, three-dimensional, high-resolution visualization of living tissue and continues to rise in popularity. As a result, there is a need to benchmark MRI data relative to FFPE-H. Previous work has established a diagnostic potential for Shannon entropy (SE) analysis of MRI texture data. Here we develop an SE framework to benchmark MRI to FFPE-H regions of interest and validate with proteomic data. We present our results for four IL biomaterials: jellyfish collagen (JC), jellyfish collagen + adipose mesenchymal stem cells (JC + ADSC), crosslinked hyaluronic acid (X-HA), and human micronized acellular cadaveric dermis (MACD). JC and

JC+ADSC yielded statistically significant higher SE values compared to X-HA ($p = 0.016$ and respectively $p = 0.0144$) and MACD ($p = 0.031$ and respectively $p = 0.033$) reflecting surprisingly higher agreement between FFPE-H and MRI data for these groups. By contrast, X-HA and MACD SE values were not statistically significantly different from each other ($p = 0.762$). Proteomics data show increased extracellular matrix collagen synthesis for JC with or without ADSC. MACD and X-HA by contrast showed increased immune surveillance and cell death pathway activation. Higher SE is consistent with diffuse boundaries between JC biomaterials and native tissue with less disrupting and/or better regenerative properties of the biomaterials. By contrast, lower SE values characterize sharper biomaterial-tissue boundaries consistent with increased cell death. The results show that SE is a useful biomarker for a biomarker's integrative potential within the tissue. Accordingly, JC has better integrative and less disruptive potential than MACD and X-HA.

Investigating the effect of imikode virtual reality game in enhancing object oriented programming concepts among university students in Nigeria

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Programming using object-oriented paradigm has gained wide popularity as a result of the object's inclusion which we experience in our day to day activities and has been successfully used in creating robust applications. Despite the successes achieved using this paradigm, the teaching and learning process in Nigeria is quite challenging as both teachers and students often find this object notation very abstract in terms of writing codes. In this study, the overall aim is to investigate the effect of Imikode – a virtual reality (VR) game amongst students of higher educational institutions in Nigeria who are studying object-oriented programming courses and to observe whether there is an improvement in their programming skills on one hand and also if there exist a positive correlation in their understanding of the course. We engaged 153 first year students who are studying computer science courses across the tertiary institutions to play the game after which we collected quantitative data using the usefulness, ease of use, ease of learning and satisfaction (USE) research instrument. The result of the survey demonstrates how the Imikode VR game motivated students in learning OOP concepts and also fostered more engagement with the technology as a veritable tool for learning. In addition, we discovered that there exist a positive correlation in their understanding of the course and an enhancement in their programming skills suggesting that the Imikode VR game can serve as an intervention strategy to demystify the abstract notion of object oriented programming paradigm in Nigeria.

Effect of the Eu-doped during spark plasma sintering of yttrium silicate powder

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Spark plasma sintering process was used to densify Eu-doped Y_2SiO_5 powder, at a temperature 1673 K. Sintering rate was evaluated during spark plasma sintering of Eu-doped yttrium silicate powder. The activation energy for Y_2SiO_5 powder densification was determined at early stage of the sintering. After sintering the microstructure was analysed from Y_2SiO_5 coupons doped with Eu^{+3}, identifying an $Y_{4\cdot76}(SiO_2)_3$ second phase presents.

On the plane lamé–Navier system in fractal domains

Diego Esteban Gutierrez Valencia[1], **Ricardo Abreu Blaya**[1], **Martín Patricio Árciga Alejandre**[1] and **Arsenio Moreno García**[2]

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This paper is devoted to study a fundamental system of equations in plane Linear Elasticity Theory, the two-dimensional Lamé–Navier system. We rewrite them in a compressed form in terms of the Cauchy–Riemann operators and it allows us to solve a kind of Riemann problem for this system. A generalized Teodorescu operator, to be introduced here, provides the means for obtaining the explicit solution of this problem for a very wide classes of regions, including those with a fractal boundary.

Silver and sodium dichloroacetate, dual agents in the cancer treatment

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The efficacy of silver and sodium dichloroacetate as dual-function agents to be used in melanoma treatment. This strategy is designed to increase the activity of these two compounds that affect DNA integrity and the mitochondria at different levels. The combination of colloidal silver and sodium dichloroacetate is more effective than each treatment alone, and the antitumor mechanism is not through immunogenic cell death.

Furthermore, this study can broadly contribute to the development of dichloroacetate-loaded silver nanoparticles and the design of targeted pharmacological formulations to fight melanoma and other types of cancer.

Dichloroacetate (DCA), an inhibitor of pyruvate dehydrogenase kinase (PDK), has been reported to have anti-cancer effects by reversing tumor-associated glycolysis.

Silver nanoparticles (AgNPs) and silver ions (Ag^+) have different levels of toxicity due to their superficial charge interactions. Silver ions are more toxic because they can interact with negative groups of proteins, producing structural changes on the cellular membrane and cytoplasmic proteins, while AgNPs can interact with DNA, causing damage and structural blocking; some studies have proposed that these nanostructures can produce increased toxicity at long exposition times due to the fact that AgNPs in aqueous solutions can oxidize and release silver ions.

Although, the mechanism of the antitumoral action of Ag colloidal or Ag nanoparticles is not properly understood, it has been reported that heavy metals react with proteins by getting attached to the thiol group and the proteins get inactivated through a mechanism implicated in avoiding the cellular proliferation of cancer cells decreases the melanoma tumor model suggesting them as a potential agent for use in cancer treatment.

The next level developmental stage of dichloroacetate loaded with silver nanoparticles targeted pharmacological formulations.

Organization of personalized didactic contents in intelligent tutoring system using expert knowledge and artificial neural network

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This work presents a model that is capable to conduct the didactic transposition of contents by using a Hybrid Intelligent Tutoring system that combines the use of Artificial Intelligence technics to present personalized content. It was observed that the same content presented for one student might not be as effective for another ones. Thus, a multilevel structure of concepts, that provides different presentation combinations of the same content, has been used. This work shows that it's possible to personalize the didactic content to encourage students, by using proximal learning patterns. These patterns are obtained from the analysis of the actions of students with positive results in the individual content organization. This system uses Artificial Intelligence techniques to reactively organize and personalize content. Personalization is possible thanks to the artificial neural network that classifies the student's profile and assigns it to a proximal learning pattern. The Expert's rules are introduced to mediate and adjust the contents reactively for each moment of the learning process. Hence, the neural network establishes the proximal learning patterns and, consequently, defines a general learning strategy that is more effective for each student. The Expert's rules adjust the strategy depending on the student's reaction during the learning process. Thus, it's possible to offer the students personalized content. The model can guide the student throughout the didactic transposition of contents, aiming the consolidation of the desired competencies, established for learning purposes. Experimental results indicate that the application of the system is feasible due to the incorporation of the expert rules and, by the use of the Artificial Neural Network, it assimilates the students' learning process behavior. The approach turned up as efficient, therefore, providing the student with better use of the content with adaptive and reactive personalized presentation.

Reduction of diagnosers for discrete-event systems

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The main drawback of implementing the traditional diagnoser for Discrete-Event Systems proposed in the literature is that its state set can be very large, requiring the use of a large amount of memory to store the diagnoser for complex systems. In this paper, we propose a greedy algorithm for the computation of a reduced diagnoser, that preserves the diagnosability of the system language and the same diagnosis delay as the original diagnoser. The reduction algorithm is based on merging states of the original diagnoser, and uses a free parameter to choose which and in what order states should be merged with a view to trying to obtain a diagnoser with the smallest possible number of states.

The future of condition-based monitoring: Risks of operator removal on complex platforms

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Complex platforms are very dicult to man-age and maintain. This is why we see teams of engineers, many highly specialized, that carry out this role for industries such as aerospace, nuclear and subsurface. It is a critical undertaking to maintain the aforementioned systems, which often have components at varying degrees of degradation. To maintain complex systems, Condition Based Monitoring (CBM) (a type of predictive maintenance that uses sensors to measure the status of an asset over time while it is in operation) is most frequently used. Artificial Intelligence (AI) models that have been developed in the area of CBM are currently not well explained, nor well understood by users or operators. When AI is brought into a complex system we observe varying degrees of success. The level of success rests on the complexity of the system, the training and understanding of the end operator as well as the maintenance processes around the system. Implementing AI or complex algorithms into a platform can mean that the Operator's control over the system is diminished or removed altogether. For example, in the Boeing 737 Air Max Disaster, AI had been added to a platform and removed the operators' control of the system. This meant that the operator could not then move outside the extremely reserved, algorithm-defined, `envelope' of operation, leading to loss of life. Therefore, the implementation of AI leading to any removal of operator system management in complex systems, especially related to aerospace and subsurface industries, has to be considered carefully. In this paper, we analyze the risks of removing operator system control and implementing algorithms, or AI, in complex systems.

(Mis)Translating entropy?: Camille flammarion and the multiple theologies of the death of the universe

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By the 1860s, the tendency of matter toward increasing chaos—or entropy—had become a fundamental tenet of the new science of thermodynamics. But in Victorian Britain, the ramifications of this second law of thermodynamics for a Christian conception of a progressive universe remained subject to heated ideological debate. Historians of thermodynamics have held up French astronomer Camille Flammarion's popular science fiction as comprehensive evidence that this entropic–theological debate was widespread across disciplines, media, and cultures. I show that Flammarion's argument has been misrepresented. Not only did Flammarion not employ entropic heat-death metaphors at all—instead evoking a hot apocalypse—but he interpreted entropy through a distinctive theology, at odds with that of British scientists. A study of Flammarion's theology, concept of entropy, and novels exhibits how investigating influential popular works can dismantle assumptions about the geographic and religious scope of the entropic–theological debate.

Online customer engagement: A practical exploration of antecedents and metrics for new content market

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The ability of new content marketing companies and marketing practitioners to engage customers online depends on their understanding of the impact of antecedents on critical online customer engagement metrics. However, there has been little scholarly research exploring online customer engagement in the context of complex, real-world environments that could guide the strategies of new brands and start-up companies seeking to establish an online presence. This paper identifies the antecedents and metrics required for identifying an appropriate online customer engagement (OCE) strategy in the context of a start-up content marketing company called ABC Investments (a pseudonym) and of more established social media platforms, such as Facebook and Instagram. Eleven OCE antecedents and six metrics were originally proposed but on completion of the research, twelve antecedents-including one new one (human face)- were determined to have impacted OCE metrics. Finally, this paper shows how antecedent and metric research can be used to develop OCE strategies.

Glassy thermal conductivity in $Cs_3Bi_2I_6Cl_3$ single crystal

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As the periodic atomic arrangement of a crystal is made to a disorder or glassy-amorphous system by destroying the long-range order, lattice thermal conductivity, κ_L, decreases, and its fundamental characteristics changes. The realization of ultralow and unusual glass-like K_L in a crystalline material is challenging but crucial to many applications like thermoelectrics and thermal barrier coatings. Herein, we demonstrate an ultralow (~0.20 W/m•K at room temperature) and glass-like temperature dependence (2–400 K) of K_L in a single crystal of layered halide perovskite, $Cs_3Bi_2I_6Cl_3$. Acoustic phonons with low cut-off frequency (20 cm^{-1}) are responsible for the low sound velocity in $Cs_3Bi_2I_6Cl_3$ and make the structure elastically soft. While a strong anharmonicity originates from the low energy and localized rattling-like vibration of Cs atoms, synchrotron X-ray pair-distribution function evidence a local structural distortion in the Bi-halide octahedra and Cl vacancy. The hierarchical chemical bonding and soft vibrations from selective sublattice leading to low κ_L is intriguing from lattice dynamical perspective as well as have potential applications.

Climate system: A global sensitivity approach

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This article is a first attempt to develop a numerical approach to solving differential equations based on Galerkin projections and extensions of polynomial chaos to analyze the sensitivity of input parameters in the Lorenz-Stenflo climate model. The sensitivity analysis was undertaken to measure the influence of key parameters (chemical properties of the atmosphere, rotation, temperature gradient, convection motion). In addition, we do simulations of the climate model in the non-chaotic case and in the chaotic case and we calculate the Sobol's indices when the parameters follow the uniform law.

Antiviral copper coatings onto thermoplastic against SARS-CoV-2

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The actual viral outbreak continues to have a tremendous impact on human health, social relations, and the economic situation worldwide. Eengineered metallic coatings can mitigate the viral transmission from the thermoplastic surfaces (fomites) touch points in transports. This goal is achievable by functionalizing thermoplastic surfaces with metals through innovative designs that inhibit or destroy the microorganisms. The life span of these functionalized surfaces depends on their physical-chemical properties and external factors (e.g., humidity, temperature, cleaning agents, etc.) that can modify the engineered surface. The presented work focus on copper-based thermoplastic surfaces obtained by different deposition methods to observe the influence of the chemical composition of the surface, but also the importance of coating structure and texture, to increase the SARS-CoV-2 inactivation rate. The in-vitro antiviral tests are realized in agreement with normalized protocols to qualify the antiviral surfaces (ISO 21702:2019). The obtained results show that the deposition method has a strong influence on both the microstructure and the surface chemistry of the engineered Cu films.

Localized buried P-doped region for E-mode GaN MISHEMTs

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The global need for electric power is increasing every day. For that, not only alternative power sources are being explored, but also the efficiency in power transmission and conversion is being investigated to cut down power losses. Transistors, the building blocks of electric converters, are usually made from silicon. Nowadays, the material properties of silicon are hindering further advancement in transistor performance in terms of operating power and operating frequency which are essential for efficient power conversion. Searching for semiconductors with superior physical properties led to the doorstep of wide bandgap semiconductors like Gallium Nitride (GaN) and Silicon Carbide (SiC).

Gallium Nitride (GaN) based High Electron Mobility Transistors (HEMT) are promising candidates to overcome the limitations of silicon power devices. Since conventional HEMTs are normally-on and power switching applications demand normally-off operation, several e-mode designs were proposed. A new design for an enhancement mode GaN HEMT is proposed along with a novel fabrication technique. Normally-off operation is achieved through the introduction of a localized P-region below the AlGaN/GaN interface underneath the gate electrode.

Since achieving high hole concentration through ion implantation is experimentally challenging, the effect of a localized buried P-region was replicated through the growth of an epitaxial P-layer in which N-wells will be later introduced. The doping concentration, thickness, and position of the P-region with respect to the AlGaN/GaN interface play an important role in controlling the threshold voltage. The doping profile in the N-wells controls the current density of the device. Simulation results conducted under ATLAS, a TCAD simulation tool from Silvaco. To study the electrical characteristics of the proposed design, ATLAS, a TCAD device simulation tool from Silvaco is used. Physical models of the simulator are based on Shockley-Read Hall recombination, Fermi-Dirac statistics, and field-dependent mobility. The simulator is calibrated using experimental data from a fabricated normally-on HEMT device. A comparison between the calibrated simulator and the experimental results is presented in showing a big match in the threshold voltage and transconductance.

Results demonstrated a successful shift in the threshold voltage to positive values. The physics behind this shift is explained through the band diagram. A sensitivity analysis is conducted showing the effect of device parameters on the threshold voltage and the current density.

Adaptive super-twisting SMC and adaptive terminal SMC of brain tumor via chemotherapy

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The treatment of brain tumor requires advance strategies based on the severity of tumors. For instance, in case of malignant tumors surgery is not advisable since these tumors are attached very closely with the sensitive tissues of brain, rather chemotherapy treatment is suggested. In this work two nonlinear controllers have been designed to determine the amount of chemotherapy to remove the tumor cells and retain suitable quantity of healthy and immune cells: the adaptive super-twisting sliding mode and the adaptive terminal sliding mode controllers. System stability and convergence has been verified by using Lyapunov stability theory. The performance of the controllers has been verified using MATLAB software based on different control parameters. Adaptive supertwisting sliding mode controller is better due to its better convergence, reduced chattering and least amount of drug used.

Bosonic and fermionic free fields are cobordant

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Preamble: Physicists use signifier "free field" in combination with adjective "bosonic" or "fermionic" to communicate with algebras of canonical commutation relations (CCR) and canonical anticommutation relations (CAR).

History: In 1990s Stanisław Lech Woronowicz invented object denoted by ב(q) (q is a complex number) which interpolates between CCR and CAR: ב(-1) is precisely free bosonic field and ב(1) it is precisely free fermionic field.

Objective: In 1995 Palle E. T. Jørgensen conjectured that the family of entities ב(q) (parametrized by q) form a continuous field of C*-algebras. Unfortunately, he proved that only for $|q| < 0.41$. He conjectured that the same is true for $|q| < 1$.

Result: I have proved Jørgensen's conjecture.

Methods: Very old and very modern methods of classification of C*-algebras were used. I will demonstrate them during the talk.

Conclusion: In the language on analysts we can conclude: bosons and fermions are cobordant. For details see arxiv.org/abs/2203.10058.

Trapping Rydberg atoms in time-varying magnetic fields

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Rydberg atoms are those which have single valence electrons in a state where the main quantum number n reaches high values. Because large quantum numbers resemble classical-like properties, such atoms may be used to bridge the quantum realm to the well-known classical world. This has resulted in interesting, and perhaps unexpected, physical phenomena such as Rydberg matter. As well, research on the scale of atomic interaction in these atoms has suggested the generation of a kind of non-demolition measurements of individual photons due to the high electric dipole moments between Rydberg atoms. Yet, as we study in this work, Rydberg atoms moving in time-dependent magnetic fields evolve over time with very similar equations of motion that a classical particle. Although this is not exclusive to Rydberg atoms–– but rather a consequence of quadratic Hamiltonians they allow to study trapping techniques beyond conventional ion traps. However, instead of paying attention to the state of the atom, we conce ntrate on the evolution operations driven by the time-varying magnetic field and, in order to prevent the state of the atom from being destroyed, we present a strategy to generate a smooth evolution without the presence of electric shocks. The technique we present shows a dynamical resistance to radiation pollution. We study stable (quantum trap) and unstable (quantum squeezing) motion in detail and introduce the conditions to generate parametric resonance in these atoms. The possibility of creating non-demolition measurements and reverse-time operations is discussed in terms of the underlying soft operators.

Nanoscaled silicon carbide on silicon: A new bandgap material for micro and optoelectronics and its unique properties title

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We report on the discovery of a new method for the synthesis of epitaxial films of nanoscale carbide on silicon and the development of the technology for its production. The method consists in the coordinated replacement of a part of the silicon matrix atoms by carbon atoms to form an epitaxial silicon carbide film. It was found experimentally that the process of Si matrix replacement occurs gradually without destroying its crystal structure. Film orientation is determined not only by the surface of the silicon substrate, but also by the crystal structure of the original silicon matrix. A comparison of the new growing method with the classical thin film growing methods is presented. The implementation of the substitution method made it possible to obtain a new type of template - a substrate with buffer transition layers, designed for growing wide-gap semiconductors on silicon, such as AlN, GaN and AlGaN. The formation of a new Si phase in the "semi-metallic" state at the SiC(111)/Si (111) interface was theoretically predicted and experimentally confirmed. The formation of Si in the "semi-metallic" state at the SiC/Si (111) interface is associated with large short-term "compressive pulses" during the Si to SiC transition. It is shown that the compression pressures arising in a thin boundary layer with a thickness of the order of several nanometers can reach values of the order of 200-250 GPa. Pressures of this magnitude lead to the formation of special, previously unknown optical, electrical, and magnetic properties of the SiC (111) / Si (111) interface. should give clear indication of the objectives, scope, results, methods used, and conclusion of your work.

Estimation of groundwater storage change in the Helmand River Basin (Afghanistan) using GRACE satellite data

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Understanding groundwater storage dynamic changes and quantifying the trends of groundwater fluctuations in the Helmand River Basin (HRB) aquifers, where the groundwater is the main source for drinking and irrigation applications, is significantly important in order to effectively manage groundwater resources. This case study quantifies the changes in groundwater storage over 18 years (i.e., from 2003 to 2021) in the HRB by employing the Gravity Recovery and Climate Experiment (GRACE) observations and Global Land Data Assimilation System (GLDAS) data due to sparse groundwater monitoring networks and lack of ground-based information. The data of observation wells was applied to validate the results of the GRACE and GLDAS outputs. The results indicate that changes in groundwater storage on average from 2003 to 2021 are equal to (-98.6 ± 226.84 mm or -1.9 ± 4.38 km^3/year). On average, during 2003 to 2021 groundwater table decline was -2.6 m in the HRB. The study indicates relatively strong correlation (0.75) between the GRACE derived data and direct in-situ measurements. This study highlights the effectiveness of the GRACE derived data for the reliable estimation of groundwater storage changes in the HRB and may contribute to sustainable groundwater resources management in the region.

Laser beam in dispersive media, photons, axions

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With the advent of lasers, light beams in the medium have become a common tool in the hands of the experimenter. With their help, success has been achieved in understanding the processes of interaction between radiation and matter. The use of the axion allows us to give a clear qualitative and, in some places, quantitative picture of the interaction of radiation and matter. Let's list the processes for which it turned out to be interesting and useful, in the author's opinion, to involve the axion model. This is the scattering of light in the DC, including scattering in the air into a solid angle of 4 π steradian. These are the processes of interphoton interaction of mutually intersecting light beams in the DS, photoluminescence, broadening of the radiation spectrum at the output of the DS. To explain the cone Cherenkov structure of the angular spectrum, it will be successful to attract an axion whose propagation velocity is greater than the phase velocity at which photons move in the medium. The traditional, according to Bohr and Einstein, scheme of the processes of interaction of radiation and matter: 1) absorption of radiation, 2) spontaneous emission of radiation, 3) forced emission of radiation in the absence of resonance between the pumping frequency and the frequencies of electronic transitions in the doping medium atoms complements the process of photon annihilation with subsequent axion decay.

Development and characterization of PDMS porous microneedles as cell culture media collecting tool in advanced microfluidic devices

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In situ real-time monitoring of physicochemical and biological parameters among advanced microfluidic devices, namely organ-on-a-chip, is considered a challenging task that needs the advancement in the multidisciplinary fields of biosensing, tissue engineering and material science. In this work, we propose a simple methodology to develop a porous polydimethylsiloxane (PDMS) microneedle (MN) patch capable to collect released biomarkers from advanced microfluidic devices. For that, two different casting materials-namely, silica nanoparticles and glucose-were used to create porous PDMS MNs, ranging their concentration between 1 and 10% (w/w), and followed by leaching/etching process to remove the casted material. To enhance the mechanical properties of porous PDMS MNs, a post-fabrication treatment with hyaluronic acid (HA) solution was applied to improve the mechanical strength of the MNs. To identify the best candidate for the intended application, a full characterization of the developed porous MN was assessed focusing on their morphology, wettability, air permeability, swelling, porosity, surface chemistry, and mechanical characteristics. Overall, it was observed that silica particles show a higher number of small and homogeneous pores with greater interconnectivity when compared with glucose. The results also indicate that the PDMS samples casted with silica at the higher concentration, are the most promising candidate to produce the porous PDMS MNs arrays. To the best of our knowledge this is the first time that porous PDMS MNs are studied as a media collecting tool in advanced microfluidic platforms.

Soldering of SiC ceramics with Ni-SiC composite using electron beam heating

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The aim of the research was focused on the solderability of two different materials, namely SiC ceramics and Ni-SiC composite material, which are finding their increasing applications especially in the electronics industry. The joints were formed using an active In-Ag-Ti based solder alloy and an electron beam was used as the heating source. The fabricated solder joints were analyzed to measure the shear strength. The highest shear strength values achieved for the solder joints were at 850 °C and reached an average of 9 MPa. The fabricated SiC/In-Ag-Ti/Ni-SiC solder joint at 850 °C was also investigated from microstructural point of view using SEM/EDX analysis. The bond between the solder and the solder substrates was formed due to the interaction of Ti and Ni with the silicon contained in these substrates. From the SEM/EDX analysis, the diffusion of the active Ti component of the solder to the interface with the Ni-SiC composite material can be observed. Likewise, diffusion of Ni from the substrate into the solder occurred. To confirm these claims, line scan analyses and point energy-dispersive analyses were performed at both interfaces. At the SiC/solder interface, Ni_3Si_2 and γ Ag_2In phases were observed. At the Ni-SiC/solder interface, ε-Ni_3Si_2, $Ti_2(Ag, Ni)$ and Ni_2In_3 phases were observed.

Responsible innovation and the Spinoza-Jonas theorem

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Innovative practices are a main feature of mankind throughout the ages, as is a more or less thorough reflection on the products of innovation. It is argued that innovation encompasses five fields of tensions: (1) motives or innovation, (2) the degree of innovation (from minor improvements to radical breakthrough innovations), (3) the range of innovation (innovation themes single and organized in effective bundles), (4) innovating alone or with partners, and (5) the innovation process and organizational institutionalization of innovation (incidental or routine).

Three innovation spearheads can be distinguished:

(1) small 'every day' innovations that are not radical, but taken together can represent major issues, such as the mass-effects of gradual obsolescence of labor on individuals, issues of climate change and of intergenerational and international solidarity

(2) the intersection of frontier technology and grand challenges, arranged into five clusters

- computer and information ethics and the use of algorithms
- automatization and artificial intelligence
- environmental issues (e.g. geoengineering/manipulating the climate, plastic soup, biodiversity)
- enhancing the quality of life (e.g., eugenics and cloning, poverty, health)
- nano-scale technology

(3) resolving the asymmetry between participants in the stakeholder approach of responsible innovation (researchers, policy makers, consumers, financers).

Many moral issues concerning innovation are not quite new and do perhaps not need an innovation of ethics. Nevertheless, there is call for a new ethics due to new issues concerning long term, interactive, cumulative and irreversible effects far and near both in place and time.

Therefore, the concept of responsibility is explained through three meanings: accountability, virtue, and task.

Responsible innovation is addressed from three perspectives beyond cost-benefit analysis: the innovation-care principle, the precautionary principle, and imperatives in several fashions (Kant, Rawls, Jonas), ending up with the conatus concept coined by Spinoza and its elaboration by Jonas into an imperative of responsibility as the preferred criterion.

A substantial part of the presentation consists of an interactive discussion about a responsible innovation issue in order to make the theoretical input as practical as possible.

Effect of thermal radiation entropy on the outdoor efficiency limit of single-junction silicon solar cells

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Incoming radiation energy illuminating a solar cell contains a certain amount of entropy, which does not contribute to output electrical work. We investigated the influence of entropy content of thermally radiated light on the maximum achievable efficiency of single-junction solar cells. We have revised the value of the Shockley-Queisser (SQ) limit for various absorber materials and took a deeper look at this effect by re-calculating the efficiency limit of crystalline silicon solar cells considering Meitner-Auger recombination. To accomplish that, we used the formulation of spectral exergy of sunlight by Candau. Then, we plugged in the exergy of AM 1.5 standard spectrum into the efficiency calculation methods used by Rühle and Richter et al. We further used a 1-dimension solar cell model by McIntosh & Altermatt and calculated the limiting efficiency of silicon solar cells under outdoor conditions. Our results show that when considering the entropy content of AM 1.5 standard spectrum, the SQ limit for silicon drops from 33.15% to 30.42%. Further, considering Meitner-Auger recombination and using measured properties of silicon, the efficiency limit lowers to 27.12% from the already established 29.43%. This suggests a 4% thinner silicon absorber, reaching a thickness of ~101 μm; hinting PV industry that a thinner Si wafer can provide the optimum outdoor energy yield. Our results have several impactful applications for the PV industry, which range from PV device design to PV module tilt optimization. The result of this study is recently published.

Diffusion hardening effect on the technological properties of high-temperature steel

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The results of research pipes diffusion hardening as an effective method for increasing the durability and reliability of power equipment are presented. The experience of commercial operation of pipes manufactured from diffusion chromized and heat-hardened steel DIN: 1.7715on the heating surfaces of the supercritical pressure boilers are generalized. It is shown that the diffusion chrome plating of pipes allowsto increase their corrosion resistance in combustion products of organic fuel (pulverized coal and gas-oil fuel) by several times.The durable strength of 100’000 hours for chromium-plated pipes is on the greater level thanfor non-chrome plated pipes that works 35’000 hours. The possibility and effectiveness of this method on the example of capacities of Trypil’skaTPP are shown.

Gas discharge synthesis of silver sulphide surface nanostructures in argon

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The modern development of nanotechnology requires an increasing number of different nanostructured elements for use in photovoltaics, sensor, laser and optoelectronic technology, photobiology and medicine, the synthesis of which is hindered by the lack of data on the basic conditions and physical mechanisms of the synthesis of surface nanostructures from gas discharge plasma products. Currently, there is no data on the relationship between the characteristics of nanostructures of superionic conductors with the characteristics of overvoltage nanosecond discharges in gases of different pressures and compositions and the characteristics of the corresponding nanostructures.

The report presents the results of research of the characteristics and transport parameters of an overvoltage nanosecond discharge in argon between electrodes made of a superionic conductor - silver sulfide (Ag_2S). The discharge was ignited at argon pressures of 13.3 - 101 kPa, and the distance between the electrodes made of the polycrystalline Ag_2S compound was 2 mm. Destruction of the electrode material during the discharge and introduction of Ag_2S vapors into the interelectrode gap occurred due to microexplosions of natural inhomogeneities on the working surfaces of the electrodes. The discharge can be used as a plasma chemical reactor for the synthesis of thin films based on silver sulfide. The results of the Raman scattering spectra of laser radiation by synthesized films based on the Ag_2S compound are presented.

A study of the characteristics of a discharge plasma in argon between electrodes made of the Ag_2S compound revealed the following:

- the maximum voltage amplitude of one polarity on the discharge gap reached 22 kV, and individual oscillations on the voltage pulse had a duration of 5-10 ns;

the maximum amplitude of the current pulses reached 100 A, the value of the pulse electric power - 10 MW with the energy in a single pulse - 119 mJ;

- the spectrum of ultraviolet radiation of the discharge was dominated by the radiation of atoms of singly charged silver ions in the spectral range of 200-300 nm and of silver atoms in the spectral range of 300-340 nm;

- Investigation of the Raman spectra of laser radiation scattering by thin films synthesized from plasma based on the gas-vapor mixture "argon - silver sulfide" showed that they consist of silver sulfide, which can be used for the development of various devices based on.

Effects of thermo-hardening and thermo-plastification at 200-280°C for microfilled epoxy-composites

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The work is devoted to the study of a new type of composites for the manufacture of special details, parts, tools or adhesive repair in the field. We have developed epoxy compounds that preserve or increase strength and ductility after heating at 200-250°C. That let, if necessary, an effective thermo-disinfection of composite toolsproducts at elevated temperatures. It is believed that conventional epoxy resins are unable to retain their physical and mechanical properties after heating above 200°C. Their feature is in simplicity of making (ordinary filling with available\cheap microfillers) without special qualification of personnel and in any conditions (outside clinics, laboratories and service centers).

In this work some of such compositions (with SiC, TiN, SiO_2-marshalite, cement) are considered. It offers to name such composites of "thermo-harden" or "thermo-plasticized". Bioneutrality, durability and heat-resistance, at 200-300°C does him a good material for rapid repair and making of the special or failing instruments in the field, travelling, military and other difficult terms.

Filling only in some cases (for SiC) allows to increase the compressive strength F. But the unfilled polymer after heating significantly (25%) loses its strength. And, all the microfilled composites taken after 250°C gave a higher than H-polymer index. All of them practically retain his strength indicator after a hard heat treatment - unlike unfilled. Two of them (with cement and gypsum) increase their strength after hard heating.

Note - that the studied nano-fillers and a number of micro-fillers (basalt fiber, etc.) do not give such effects, losing strength as shown in the example of epoxide with 0.01 wt% graphene oxide.

The same picture was observed when such an epoxy resin was filled with a micro-iron in the work of Starokadomsky . There, unfilled also have a maximal strength, but significantly reduced it after 250°C. On the contrary, the iron-filled samples were strengthened (sometimes by 40–45%) precisely after a hard heating.

Another example of thermal hardening and thermal plasticization (elimination of unwanted brittleness) is observed for compositions of epoxy with water-binders - gypsum G5 and cements M400-M500. These effects were recorded and published by us in works [4,8,10,50,54]. After 250°C, the compressive strength of composites with the neat (non-hydrated) cement almost does not change, and with pre-cured it increases, while the unfilled polymer noticeably (by one third) loses its strength. The neat (non-hydrated) gypsum gives approximately the same reinforcing effect in the composite heated at 250°C. In all cases, after 250°C, the abrasion resistance increases noticeably (the weight of the abraded mass decreases), while for the unfilled one, the resistance decreases.

It is still difficult to explain the nature of this effect. It is probably related to the nature of the distribution and self-organization of some fillers in the polymer. Thus, SEM-Microscopy exhibits the morphology of a polymer composite with SiC. Here, an interesting fact is visualized of a change (crushing and coarsening) of the size of filler microparticles (SiC), their transformation into a reinforcing, bonded system. This should have a positive effect on the strength of the composite in the initial and strongly heated state.

Surgical or non-surgical treatment of plantar fasciopathy (SOFT). Study protocol for a randomized controlled trial

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Background: Plantar fasciopathy is the most common reason for complaints of plantar heel pain and one of the most prevalent musculoskeletal conditions with a reported lifetime incidence of 10%. Multiple treatments are available, but no single treatment appears superior to the others.

Radiofrequency microtenotomy for the treatment of plantar fasciopathy has shown potentially positive effects on short- and long-term outcomes (> 3 months). However, the effect compared to a more conservative treatment (i.e. heavy-slow resistance training) is currently unknown. This trial compares the efficacy of heavy-slow resistance training and radiofrequency microtenotomy treatment with supplemental standardised patient education and heel-inserts in improving the Foot Health Status Questionnaire pain score after 6 months in patients with plantar fasciopathy.

Methods: In this randomized superiority trial, we will recruit 70 patients with ultrasound-confirmed plantar fasciopathy and randomly allocate them to one of two groups: (1) Heavy-slow resistance training, patient education and a heel-insert (n = 35); (2) Radiofrequency microtenotomy treatment, patient education and a heel-insert (n = 35). All participants will be followed for 1 year, with the 6-month follow-up considered the primary endpoint. The primary outcome is the Foot Health Status Questionnaire pain domain score.

Discussion: Traditionally, surgical treatment for PF is considered as a last resort, but could alternatively be considered at an earlier stage. The treatment is reportedly as effective as the more extensive and invasive surgery, open plantar fasciotomy. Moreover, a faster return to normal activities, fewer complications, and reduced pain are seen.

By comparing the two treatment options, we should be able to answer if radiofrequency microtenotomy compared with heavy-slow resistance training is superior in patients with plantar fasciopathy.

Breast cancer detection techniques based on machine learning and deep learning

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Recently, the incidence of breast cancer has spread widely worldwide. In 2020, 2.3 million women were diagnosed with breast cancer and 685,000 deaths were recorded worldwide. At the end of 2020, there were 7.8 million women alive who were diagnosed with breast cancer in the past five years, making it the most common type of cancer in the world.

Most scientific studies have confirmed that when the disease is diagnosed early, the treatment is faster and guaranteed.

Therefore, in this study we will present different techniques of diagnosing breast cancer using machine and deep learning methods. We got the dataset from Kaggle images (Breast Histopathology; 198,738 IDC(-) image patches; 78,786 IDC(+) image patches) and tabular data (Breast Cancer Wisconsin (Diagnostic) Data Set) to diagnose breast cancer.

In machine learning we used text data and different algorithms and compared the results. Algorithms: neighbors, naive_ bayes, dummy classifiers, random forest classifier, logistic regression, decision tree classifier and SVM (support vector machine classifier).

In the deep learning part, we used images dataset and CNN (Convolutional neural network) to classify the breast cancer positive and negative results.

Integration of smart, ultrathin and flexible cellulose-based printed sensors for process control and health monitoring

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Integration of facile, thin, and flexible sensors is an emerging trend in production control and structural engineering. Among various sensors, highly porous cellulose-based printed sensors offer several advantages including biodegradability, versatility, flexibility, high sensitivity and chemically inert with minimal or no effect on the mechanical integrity of the structures. Printed cellulose sensors are suitable for determining the cross-linking reactions, moisture content, temperature and health monitoring of polymers, wood, composites and adhesives. However, it is vital to optimizing the paper type and printing parameters depending on the type of material and sensor functionality.

This work demonstrates the potential application of cellulose-based printed sensors for their integration in polymers, composites and adhesives for various purposes. Sensors integrated into polymer matrix such as epoxy, phenol-formaldehyde, urea-formaldehyde etc., allows real-time in-situ analysis of the cross-linking of the resin. The ability of cellulose-based sensors of tracking the real-time changes in the physical state or cross-linking of resin is an essential prerequisite for the production control of polymer composites, especially fiber-reinforced thermosets. Since, physical properties of the material hugely depend on the degree of cross-linking. On the other hand, integrated sensors are effectively used to monitor the humidity and temperature of the thermoplastic and thermoset polymer composite. For instance, the printed sensor on abaca paper is ideal for measuring the degree of cure of wood adhesives at various temperatures. Once the curing is completed, the integrated sensor was used to monitor the moisture content in wood. Cellulose-based sensors offer significant potential and are suitable for integration into structural components taking into consideration that it not only allows tracking of real-time data, but also ideal for minimal invasive integration.

Advanced materials provided by food waste biomass source to be green phway for a sustainable society

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At the present time, advanced materials are important to develop future innovative technologies and processes highly concerned with environment-ecofriendly approaches. In particular, the use of biomass and recycled waste sources is making innovation and technology greener. As the earth continues to be damaged year by year, the establishment of a low-carbon society is expected, and advanced materials are being constrained by this trend. In addition, since the United Nations Sustainable Development Goals (SDGs) were launched in 2015, there is an even greater demand for advanced materials. Against this background, effective utilization of biomass resources and waste through refining and circulation processes is necessary to build a sustainable society with low carbon, recycling, and nature symbiosis. From this perspective, the use of material development techniques can contribute to low carbon, recycling, and nature symbiosis. Based on this basic concept, one of the key perspectives is to incorporate biomass materials and plant-derived chemicals as advanced green process technologies. However, by utilizing biomass sources and their wastes, people are planning symbiosis of environment conservation and development of the economy. In such situation, people have already recognized the importance of lingo-cellulosic residues from agriculture and forestry residues since they are abundant in the material resources. At this time, there are innovative technologies of regenerative cellulose for advanced materials in medical, tissue regeneration, and medicines. In these cases, material raw materials could be sourced from food wastes.

From the point of view of sustainable development goals, advanced materials provided from food wastes and other green sources are highlighted in this lecture. In particular, biomass plants, including cellulose and the related chemicals, are introduced to advanced functional materials belonging to SDGs categories. Such a green pathway through food waste regeneration is very necessary for our future, as it enables a symbiosis between environmental preservation and economic development, and can also contribute to building a society in harmony with nature.

Building functional Exosome@MicroRNA ossification factors and its application in bone tissue regeneration

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Gene therapy is a new therapeutic tool that aims to treat diseases by introducing exogenous DNA or RNA fragments into target cells or tissues to correct or compensate for gene deletions and turn off or suppress abnormally expressed genes. Although gene therapy has been widely applied in the treatment of cancer, genetic diseases and autoimmune diseases, its application in tissue regeneration is limited by the ease of miRNA degradation and the lack of efficient gene deliverying systems. Herein, instead of routinely used growth factors,Exosome@MicroRNA ossification factors constructed by exosomes and microRNA-26a (miR-26a) was reported. Hydorgel was further coatd for bone regeneration application. The ossification factors Exosome@microRNA-26a (Exo@ miR-26a) had a significantly increased effect on bone regeneration because of exosome can stimulate angiogenesis and miR-26a can promote ossification-related gene expression. Exosome can also down-regulate the expression of osteoclast-related genes in transfected cells, which further enabled the differentiation of stem cells into osteoblasts. These findings demonstrate the great promise of Exo@ miR-26a for bone regeneration and provide a new strategy for the application of gene therapy to tissue engineering.

Re-understanding the reaction mechanism of aqueous Zn-Mn battery in sulfate electrolytes: Role of the Zinc Sulfate Hydroxide

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Rechargeable aqueous Zn-Mn batteries have garnered extensive attentions for next-generation high-safety energy storage. However, the charge storage chemistry of Zn-Mn batteries remains controversial. Prevailing mechanisms include conversion reaction and cation (de)intercalation in mild acid or neutral electrolytes, and MnO_2/Mn^{2+} dissolution-deposition reaction in strong acidic electrolytes. Herein, we propose a $Zn_4SO_4{\bullet}(OH)_6{\bullet}xH_2O$ (ZSH) assisted deposition-dissolution model to elucidate the reaction mechanism and capacity origin in Zn-Mn batteries based on mild acidic sulfate electrolytes. In this new model, the reversible capacity originates from a reversible conversion reaction between ZSH and $ZnxMnO(OH)_2$ nanosheets; in which the MnO_2 initiates the formation of ZSH but contributes negligibly to the apparent capacity. The role of ZSH in this new model is confirmed by a series of operando characterizations and by constructing Zn batteries using other cathode materials (including ZSH, ZnO, MgO, and CaO). This research may refresh the understanding of the most promising Zn-Mn batteries and guide the design of high-capacity aqueous Zn batteries. Furthermore, we demonstrate that ZnO can be used as an efficient cathode and electrolyte additives to improve the electrochemical performance of MnO_2 electrode.

Hyaluronic acid-guided assembly of ceria nanozymes as plaque-targeting ROS scavengers for anti-atherosclerotic therapy

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Introduction: Oxidative stress is a distinguishing feature in atherosclerosis disease. Reactive oxygen species (ROS) can increase the oxidized low-density lipoprotein (ox-LDL) and oxidative damage to macrophages in the plaque. Although antioxidant agents such as N-acetylcysteine are used to treat atherosclerosis, but provide a poor clinical benefit to the majority of patients with atherosclerosis. Here we have designed hyaluronic acid-guided assemblies of ceria nanozymes (HA-CeO_2 NPs) as novel plaque-targeting ROS scavengers.

Methods: Hyaluronic acid-guided assembly of ceria nanozymes were prepared via green synthesis. HA-CeO_2 NPs were characterized by Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) and X-ray powder diffraction (XRD). The particle size and morphology of ceria nanozymes were characterized by dynamic light scattering (DLS) and high resolution transmission electron microscopy (HRTEM). SOD-mimic activities and elimination of hydroxyl radical were measured to evaluate the antioxidant ability of CeO_2 nanozymes. Cellular uptake, cytotoxicity of CeO_2 nanozymes, cellular ROS scavenging process and cell protection under high levels were performed in vitro cell experiments. Besides, inhibition of cellular uptake of ox-LDL by ceria nanozymes were well investigated by means of Dil-labeled ox-LDL. Plaque targeting and treatment of atherosclerosis were investigated in ApoE-/- mice.

Results: The introduction of hyaluronic acid not only provides the stability and biocompatibility, but also surprisingly enhances SOD-mimic activities of ceria nanozymes compared to bare CeO_2 precipitates, dextran or poly-aspartic acid coated ceria nanozymes. Interestingly, we find HA-CeO_2 NPs not only actively target plaque-associated macrophages in atherosclerosis to remove superfluous ROS and protect macrophages from ROS-caused damages, but also effectively inhibit endocytosis of ox-LDL by activated macrophages.

Conclusion: These findings advance our understanding of antioxidant agents for treatment of atherosclerosis. We believe HA-CeO_2 nanozymes can serve as a simple and promising platform for anti-atherosclerotic therapy.

A discriminative level set method with deep supervision for breast tumor segmentation

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Breast tumor segmentation in B-mode ultrasound imaging is important for analyzing, identifying, and diagnosing tumors. The level set is an approach most widely used in breast segmentation. However, its effectiveness is harmed by a dearth of semantic information. On the other hand, deep networks contain rich semantic information but loss much influential low-level details. This paper proposes a novel deep-feature embedded level set group to exploit semantically enriched features for breast tumor segmentation. First, a UNet-based network is trained to extract different features at different stages. Each stage has unique features depiction. Then, a novel level-set method is integrated at the end of each stage to approach more accurate and precise features maps. A new feature-discriminator is devised in the energy function of the level set method to refine the low confidence pixels at the boundaries. Lastly, the outputs of the level set method at different stages are incorporated into final feature maps to further empower the segmentation process. The model's effectiveness is estimated on different metrics, like Accuracy, Dice, and IoU values for two different datasets. Furthermore, the efficiency of the model is investigated by performing a comparison with several state-of-the-art classic segmentation methods and deep learning methods.

The proposed method outperformed segmenting breast ultrasound tumors in terms of Dice and IoU for datasets A and B (with p -value < 0.005 against

compared methods). Additionally, the performance of the proposed approach is evaluated using the Area Under Receiver Operating Characteristics curve (AUC) and Mean Absolute Error (MAE). Our findings indicate that the proposed method seems to gain superiority over other methods by obtaining a lower MAE rate with the highest value of the AUC and has obtained the best cut-off to deal with the noticeable glitches present in other approaches and generates more accurate segmentation results for tumors in complex images.

Metallic natural resources commodity prices volatility in the pandemic: Evidence for Silver, Platinum, and Palladium

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The current study investigates volatility in natural resource commodity prices in the case of the US. Particularly, this study focused on the rarely explained indicators of natural resources, including palladium, platinum, and silver price volatility, from February 28, 2012, to March 18, 2020. Since the Covid-19 pandemic creates havoc in the global economic system, that creates uncertainty in the natural resources market. Therefore, the period of the Covid-19 pandemic is also considered in the empirical investigation. This study uses the traditional autoregressive conditional heteroscedasticity(ARCH) approach, which reveals that the ARCH effect is valid in the mentioned variables in both the pre and post Covid-19 pandemic periods. Besides, this study also employed the threshold generalized autoregressive conditional heteroscedasticity (TGARCH) and exponential generalized autoregressive conditional heteroscedasticity (EGARCH) models to analyze shock asymmetry. The estimated outcomes asserted that platinum and silver prices are more sensitive to negative shocks such as the Covid-19 pandemic. However, positive shocks play a more influential role in palladium price volatility. Thus, the shock asymmetry is valid for all three metallic resources. Based on the empirical findings, this study suggests implementing price ceiling policies. Besides, metallic resources hedging and the imposition of strong regulations in the financial market could help reduce volatility in natural resources.

Energy and greenhouse gas footprint analysis of conventional and alternative tillage practices under rainfed and irrigated rice-wheat systems of Nepal

Shikha Thapa Magar[1], Jagadish Timsina[2], Krishna Prasad Devkota[3] and **Liang Weili[1]**

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The conventional tillage practices in the rice-wheat cropping systems of the Indo-Gangetic Plains are not only energy-intensive but also release high quantities of greenhouse gases calling for more sustainable tillage methods Here, to assess the total energy use, energy use efficiency, greenhouse gas emissions, and total global warming potential in rainfed and irrigated rice-wheat systems, we compared three alternative tillage practices with conventional tillage in 84 on-farm trials in two years in Dhanusha and Sunsari districts of Nepal. The compared tillage practices were: puddled transplanted rice - conventional tillage wheat, puddled transplanted rice – zero tillage wheat, dry direct-seeded rice – zero tillage wheat, and unpuddled transplanted rice – zero tillage wheat. In both districts, the total energy use was significantly lower in dry direct-seeded rice (by 17-18%) and unpuddled transplanted rice (by 15-17%), respectively than in puddled transplanted rice; and was lower by 12.5-19% in zero tillage wheat than conventional tillage wheat. In both crops, the total global warming potential was lower for alternatives tillage practices compared with their conventional counterparts. The higher energy use efficiency with lower total global warming potential in alternative tillage practices could be the resilient and risk minimization strategies in the rice-wheat systems under both irrigated and rainfed conditions. To offer the most promising incentive for a transition from conventional to reduced tillage practices, excessive use of herbicides in dry direct-seeded rice and unpuddled transplanted rice should be addressed.

Fluorite structure-based semiconductor-ionic materials for new generation fuel cell applications

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Recent research and development on semiconductor-ionic superionic conducting nanocomposites as alternative electrolytes lead to a new trend in low-temperature solid oxide fuel cell (SOFC) and proton ceramic fuel cells (PCFC). This can be traced from a radical new invention of the single-layer fuel cell (SLFC) or electrolyte-free fuel cell (EFFC), i.e. one semiconductor-ionic component instead of anode/electrolyte/cathode three components can realize fuel cell technology. Such semiconductor-ionic nanocomposite materials can integrate the functionalities of fuel cell's anode, electrolyte, and cathode into one component. This could represent major progress and breakthrough in fuel cell science and technology and lay grounds for a new era of fuel cell R&D and commercialization.

Solid oxide fuel cell (SOFC) technology depends on the electrolyte, yttrium stabilized zirconium (YSZ), but it requires a temperature over 700°C to operate properly due to the requirement of sufficient ionic conductivity. The situation could now be improved if replacing YSZ with a SIM with high ionic conductivity to develop new materials and technologies: Semiconductor-ionic nanocomposite materials and semiconductor-ionic fuel cells (SIFCs). The SIFC may demonstrate high performance at temperatures well below 550°C.

Current semiconductor-ionic materials may be classified into three types as I) Single-phase semiconductors, e.g. perovskite and layered structured oxides, $SmNiO_3$, $LiCoAlO_2$, $LiNiFeO_2$, etc. These semiconductors with narrow bandgap have shown metal or high electronic (hole) conductivity to experience a transition to ionic conduction by proton insertion from fuel cell operation; II) Wide bandgap oxides, typically as fluorite structure CeO_2. Both doped ceria or deficit CeO_2-d can change from insulating or electronic conduction to a proton conductor in the fuel cell operation; III) Semiconductor and ionic conduction form two-phase heterostructural materials, where percolation of both electron and ion-conducting paths result in comparable or balanced electronic and ionic conduction. This presentation will focus on fluorite-based semiconductor-ionic materials, electrical properties and electrochemical performances, material design principles, and device technology.

Intelligent aging diagnosis of conductor in smart grid

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Quantitatively aging diagnosis of conductor surface remains critical challenging in fault diagnosis of smart high voltage electricity grid. Inspired by the facial age estimation in computer vision, this work proposes a label-distribution deep Convolutional Neural Networks (CNNs) model, which includes an AlexNet-based deep convolution network and a designed loss embedded with Gaussian label distribution. The aging diagnosis problem of conductor morphology is transformed into a multi-classification problem. The proposed model is improved via a weakly labeled training dataset and a designed loss function (combination of entropy loss, cross entropy loss and Kullback-Leibler divergence loss). Compared with four frequently used CNNs-based classifiers, the proposed classifier on the collected dataset achieves a better performance. In addition, the influence of parameters and types of label distribution on classification accuracy is also investigated. Here a promising technique is presented for the aging estimation of aged conductor with a high accuracy when the images of conductor surface are available.

Mechanism of emodin in the treatment of rheumatoid arthritis

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Rheumatoid arthritis (RA) is a chronic, systemic, and autoimmune disease, and its main pathological changes are inflammatory cell infiltration accompanied by the secretion and accumulation of a variety of related cytokines, which induce the destruction of cartilage and bone tissue. Therefore, the modulation of inflammatory cells and cytokines is a key therapeutic target for controlling inflammation in RA. This review details the effects of emodin on the differentiation and maturation of T lymphocytes, dendritic cells and regulatory T cells. In addition, the systematic introduction of emodin directly or indirectly affects proinflammatory cytokines (TNF-α, IL-6, IL-1, IL-1β, IL-17, IL-19, and M-CSF) and anti-inflammatory cytokines (the secretion of IL-4, IL-10, IL-13, and TGF-β) through the coregulation of a variety of inflammatory cytokines to inhibit inflammation in RA and promote recovery. Understanding the potential mechanism of emodin in the treatment of RA in detail provides a systematic theoretical basis for the clinical application of emodin in the future.

Geometric basis of action potential of skeletal muscle cells and neurons

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Although we know something about single-cell neuromuscular junctions, it is still unclear how multiple skeletal muscle cells coordinate to complete intricate spatial curve movement. Here, I propose a hypothesis that skeletal muscle cell populations with action potentials are aligned according to curved manifolds in space(a curved shape in space), and the skeletal muscle also moves according to the corresponding shape(manifolds) when a specific motor nerve impulse is transmitted. the action potential of motor nerve fibers has the characteristics of time curve manifold and this time manifold curve of motor nerve fibers come from visual cortex in which a spatial geometric manifolds are formed within the synaptic connection of neurons. This spatial geometric manifold of the synaptic connection of neurons originates from spatial geometric manifolds in outside nature that are transmitted to the brain through the cone cells and ganglion cells of the retina. The essence of life is that life is an object that can move autonomously, and the essence of life's autonomous movement is the movement of proteins. Theoretically, because of the infinite diversity of geometric manifold shapes in nature, the arrangement and combination of 20 amino acids should have infinite diversity, and the geometric manifold formed by the protein three-dimensional spatial structure should also have infinite diversity.

Organizational innovation: The missing link between environmental scanning and organizational resilience

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Purpose: By incorporating the Organizational Information Processing Theory (OIPT), this study examines the impact of environmental scanning on organizational resilience through the mediation of organizational innovation in Egyptian manufacturing SMEs during the catastrophic event of COVID-19 pandemic.

Design/methodology/approach: The data for the mediation analysis was collected using a cross-sectional design in this study. Data was collected from a sample of 249 Egyptian SMEs using a self-administered questionnaire. The hypotheses were tested using the Smart Partial Least Square Structural Equation Modeling approach (PLS-SEM).

Findings: The results of the statistical analysis revealed that organizational innovation affected organizational resilience. Environmental scanning did not directly affect organizational resilience. However, organizational innovation fully mediated the relationship between environmental scanning and organizational resilience, thereby proving our point of view regarding the role of the OIPT in transmitting and translating environmental scanning information into innovative capabilities for adaptation.

Originality: This research is the first to investigate the role of environmental scanning in building organizational resilience through organizational innovation in the context of Egyptian SMEs.

Research limitations/implications: The sample size was small, and only Egyptian manufacturing SMEs were included. The results in the service sector and in other countries may differ. This study was cross-sectional, which is limited in its ability to trace the long-term effects of environmental scanning and organizational innovation on organizational resilience. Accordingly, a longitudinal study should be carried out.

Recent advances of magnetic gold hybrids and nanocomposites, and their potential biological applications

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Magnetic gold nanoparticles (mGNP) have become a great interest of research for nanomaterial scientists because of their significant magnetic and plasmonic properties applicable in biomedical applications. Various synthetic approaches and surface modification techniques have been used for mGNP including the most common being the coprecipitation, thermal decomposition, and microemulsion methods in addition to the Brust Schiffrin technique, which involves the reduction of metal precursors in a two-phase system (water and toluene) in the presence of alkanethiol. The hybrid magnetic–plasmonic nanoparticles based on iron core and gold shell are being considered as potential theragnostic agents. Herein, in addition to future works, we will discuss recent developments for synthesis and surface modification of mGNP with their applications in modern biomedical science such as drug and gene delivery, bioimaging, biosensing, and neuro-regenerative disorders. I shall also discuss the techniques based on my research related to the biological applications of mGNP.

Inorganic oxide-based photoelectric materials and devices

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Focusing on semiconductor optoelectronic materials, the design and preparation of new materials, device optimization and development, electrical transport mechanism and device application are carried out to study the regulation of photoelectric properties, and the regulation strategy of new materials and new properties is confirmed from the theoretical design and experimental results: Form the research paradigm of new semiconductor materials and devices, and solve the important and difficult scientific problems faced by the application of semiconductor materials and devices in flexible electronics with new ideas.

Effects of ridge-furrow rainwater-harvesting with biochar application on sediment control and alfalfa (Medicago sativa L.) fodder yield increase in semiarid regions of China

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Purpose: Drought and soil erosion are significant environmental challenges to agricultural production in the Loess Plateau of China. We hypothesized that ridge-furrow rainwater-harvesting, especially tied-ridge-furrow rainwater-harvesting, with biochar application would increase soil moisture, temperature, and alfalfa fodder yield, and reduce runoff and sediment yield.

Materials and methods: A split-plot design experiment was conducted to determine the effects of biochar application patterns (biochar application pattern and no biochar application pattern) and tillage practices (tied-ridging, open-ridging, and flat-planting) on soil temperature, moisture, runoff, sediment yield, fodder yield, and water use efficiency (WUE) of alfalfa during two consecutive alfalfa-growing years: 2019 and 2020.

Results: Biochar application decreased runoff, sediment yield, soil temperature, and increased soil water storage, compared to no biochar application. Open-ridging and tied-ridging significantly increased soil water storage, fodder yield, WUE of alfalfa, and decreased runoff and sediment yield, compared to flat-planting. Compared to no biochar application, soil water storage for biochar application increased by 34.51 mm during alfalfa growing season over two years. The mean runoff and sediment yield for no biochar application were 1.48-1.69 and 1.94-2.25 times greater than that for biochar application, respectively. Compared to flat-planting, the mean decrease of runoff and sediment yield was 27.4-31.9% and 60.1-64.7%, respectively, for open-ridging, while it was 37.1-55.2%

and 71.8-82.4% for tied-ridging. The mean increase of soil water storage, fodder yield, and WUE of alfalfa for open-ridging was 39.5-52.1 mm, 26.2-31.7%, and 10.07-14.86 kg ha^{-1} mm^{-1}, respectively, while it for tied-ridging was 31.2-60.5 mm, 26.5-35.2%, and 12.14-16.55 kg ha^{-1} mm^{-1} over two years.

Conclusions: Tied-ridge-furrow rainwater-harvesting with biochar application is a potentially effective adaptation technology that could control soil erosion and increase alfalfa fodder yield in semiarid regions used for determining the oxygen-independent activity of granulocyte-macrophage cells.

Rational design of organic compounds to modify the interfaces for fabricating high-performance perovskite solar cells

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Perovskite solar cells (PSCs) have become a hot topic in recent years due to their low fabrication costs and rising efficiencies. However, the stability degradation and the reduced efficiency caused by defect states in metal halide perovskites are the main constraint to the development of PSCs. At present, we have successfully designed and synthesized a range of organic materials with excellent passivation effect, elevated carrier mobility, and appropriate energy levels as interface modifications in PSCs, effectively improving their performance and stability. For instance, D-A-D type organic molecules were designed to enhance the hole extraction at PTAA/perovskite interface to enhance the performance of PTAA-based inverted PSCs. BDADBr was utilized as surface passivators at the buried surface of perovskite, which enlarged the grain size and boosted the device with enhanced efficiency and stability. We believe the rational design of organic molecules to modify the interfaces of PSCs is an effective method to fabricate high-performance PSCs.

Addressing the challenges in semantic segmentation of pavement crack images: A study of possible solutions

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Deep convolutional neural networks (CNNs) are commonly employed in recent techniques for pavement crack segmentation. Despite the reasonable results produced by these CNNs, they are still not able to beat human-level performance. Humans are able to recognize defects with ease, even when the defects change in viewpoint, scale, illumination, or when they are translated or rotated. Additionally, humans are able to recognize defects even when they are partially obscured. To address these challenges, state-of-the-art methods for pavement crack segmentation employ deep learning techniques to learn the various representations of defects from given images. However, achieving the accuracy of these state-of-the-art methods requires pixel-level annotated images, which are often limited or unavailable for many applications. The collection of these annotated datasets is time-consuming and requires significant investment, making pavement crack segmentation a challenging task. Furthermore, if a model is trained on a finite set of labeled images, it may perform well on samples that resemble those in the training set, but there is no guarantee that the model will generalize well to other images. This is known as the problem of data scarcity. Additionally, datasets with images of cracks are often scarce and characterized by high class imbalance. For these reasons, pavement crack segmentation remains a topic of active research. This work provides a comprehensive review of recent research progress and future prospects in computer vision frameworks for crack detection of civil infrastructures, including asphalt, concrete, and metal-like materials, and discusses possible solutions to the major challenges facing this field.

Traceable nanoparticles with dual targeting and ROS response for RNAi-based immunochemotherapy of hepatocellular carcinoma treatment

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Background: Globally, liver cancer ranks 6th in cancer incidence and 2nd in mortality. Traditional treatment relies on surgical resection and chemotherapy. However, the effectiveness of chemotherapy is severely hampered by immunosuppressive tumors. The immunosuppressive effects of the tumor microenvironment severely hinder the effectiveness of chemotherapy, such as elevated levels of immunosuppressive cytokines, especially tumor growth factor beta (TGF-β).

Objective: To modify the immune microenvironment of hepatocellular carcinoma and improve its therapeutic outcome using siRNA against tumor growth factor β (siTGF-β).

Methods: In this study, we designed and constructed a ROS-responsive targeted nano-therapeutic system, which is a combination of immunomodulation and chemotherapy based on RNA interference technology (RNAi), with a core-shell structure of 120 nm in size and good stability and magnetic properties. The system is capable of (I) active targeting via SP94 receptor-mediated endocytosis pathway, (II) controlled release of drug molecules and contrast agents with changes in the local microenvironment (changes in ROS), and (III) in vivo tracking of the nanosystem for visualization applications.

Results: The in vitro and in vivo results demonstrate that the constructed immunochemotherapy system can effectively down-regulate TGF-β expression and significantly improve the efficacy of clinical chemotherapeutics in hepatocellular carcinoma. The use of this synergistic treatment approach significantly prolonged the survival of mice. In conclusion, the immunochemotherapy system designed and constructed in this chapter provides a flexible and effective synergistic treatment system, which provides a new therapeutic idea for the treatment of other solid tumor diseases of the digestive system.

Conclusion: The study indicates that this immunochemotherapeutic platform can serve as a flexible and powerful synergistic system for treatment with brain tumors as well as other brain diseases in central nervous system.

Hybrid two-stream dynamic CNN for view adaptive human action recognition using ensemble learning

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Human actions are sequential, structured patterns of body parts and movements. This paper presents a hybrid two-stream convolutional neural network (H2SCNN) for recognizing actions from sequences by exploring statistical information like skeletons. This aims to exploit the skeletons entirely and identify the actions correctly by merging the different motion-related features. These features include motion and joint features. The framework calculates the distance between consecutive sequences to form the temporal information required for the recognition process. The proposed H2SCNN is based on two stages. The first step will use the neighborhood feature model to process both inputs individually. In the second stage, it performs ensemble learning and takes advantage of the diversity of multiple features by fusing them together. The multi-task ensemble learning model helps the system to improve the prediction ability of H2SCNN. Experiments on the benchmark dataset have shown the superiority of the proposed model with other recent approaches.

Oxidation and electrical properties of Cu-Mn_3O_4 composite coating obtained by electrodeposition on SOFC interconnects

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Solid Oxide Fuel Cells (SOFCs) as promising energy generation devices have received significant attention due to their high efficiency, environmental advantages and excellent fuel flexibility. Among all components, interconnect is a key one to electrically connect single cells and separate fuels and oxidizing gases in the cell stack. Cr-containing ferritic stainless steels have been widely used as SOFC interconnects due to the low material cost, compatibility of thermal expansion behavior with other components of the cell. However, during long-term exposure to an oxidizing atmosphere at high temperature, the electrical resistance of the surface scale is always increased due to the continuous growth of Cr_2O_3 scale. Another fatal shortcoming is the outward diffusion of chromium, which causes cathode chromium poisoning and subsequently rapid degradation of the cell performance. To protect SOFCs from chromium poisoning and to improve electrical properties, the Cu-Mn_3O_4 composite coating with a thickness of around 5 μm has been prepared on SUS 430 ferritic stainless steel by means of electrodeposition and then exposed in air at 800°C corresponding to the cathode atmosphere of SOFC. After 1 and 5 weeks of exposure, a dual-layer oxide structure primarily comprising an external layer of CuO followed by $(Cu,Mn,Fe)_3O_4$ spinel and an internal layer of Cr-rich oxide was thermally grown on the coated steels. The scale area-speciffc resistances (ASRs) of the coated steels were lower than the scale ASR of the uncoated steel after identical thermal exposure. The results showed that the external layer of CuO/$(Cu,Mn,Fe)_3O_4$ spinel not only mitigated the growth of Cr-rich oxide internal layer and suppressed the outward diffusion of chromium from the Cr-rich oxide, but also improved the electrical performance of the surface scale.

Collaboration and partnerships between South African higher education institutions and stakeholders: Case study of a post-apartheid University

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In this paper we attempt to locate collaboration and partnerships between higher education institutions and their stakeholders. These include the state, students, teaching and administrative staff, the community and corporate entities. The purpose of this paper is to evaluate the contribution of stakeholders to the developmental trajectory and sustenance of higher education institutions using the University of the Western Cape in Cape Town, South Africa as the case study. The paper analysed existing scholarship to understand the importance of stakeholders and their impact on higher education institutions. The study first examines the stakeholders' concept in the post-apartheid period, the concept of stakeholder in relation to HEIs, UWC and collaborations and partnership with stakeholders from a theoretical perspective, and the stakeholder collaborations and partnership from UWC perspective. The study adopted a qualitative approach utilising existing data from literature and interviews with participants. Conceptual analysis was used to analyse the data. Data were collected through semi-structured interviews with key participants. In total, 10 participants participated in the interviews. Findings revealed that collaboration and partnerships between institutions of higher education and their stakeholders seem to make enormous contributions to the university's achievements in terms of infrastructural development, research, quality of teaching and many more. However, findings also reveal that these collaborations and partnerships have along the way encountered several tensions and challenges which often constitute barriers to the growth and academic advancement of the university.

Prevention of smombie accidents using deep learning-based object detection

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With the growing popularity of smartphones, there has been an increase in the number of accidents involving users walking on stairs or crosswalks while using smartphones. Warning signs and images have been placed around dangerous locations in certain areas. However, this has not been significantly effective in reducing similar incidents. We propose a deep learning method based on object detection using a smartphone. Users are notified of impending detection risks on their smartphone's screen. Tests demonstrated that our approach could detect stairs and crosswalks with high accuracy (96.7%). The proposed smartphone application includes deep learning network information, hyperparameter information, and user-experience. Thus, users viewing their smartphone screens while walking can use the proposed solution to prevent accidents. As our knowledge, this is the first approach in the world to warn an imminent danger for smombies using a deep learning-based method.

An integrated model of supply chain quality management, Industry 3.5 and innovation to improve manufacturers' performance – A case study of Vietnam

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Small and medium enterprises (SMEs) play an inviolable role in social and economic growth in developing countries. Although SMEs are flexible in operation, they bear disadvantages such as accessing financial resources, recruiting talents, and limited managerial capacities. Digitalisation is, therefore, more challenging for these companies. Following an open-end approach for theory development, the paper generalises empirical evidence of a medium-sized manufacturer to a conceptual model and an implementation pathway to fast-track digital transformation. The company successfully adopted multiple SCQM systems and Industry 3.5 in a relatively short period. Knowledge management is the key to optimise knowledge flow and facilitate digital transformation. The paper contributes to the supply chain management literature by proposing an SCQM and Industry 3.5 integration model and proposes a pathway for such integration in developing markets. This approach has been proved to be an efficient way to fast-track integration and provide significant organisational benefits to the companies.

Leveraging semantic saliency maps for query-specific video summarization

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Automatic video summarization is a technique that allows us to easily understand and analyze large amount of visual data. Methods in the literature do this by dividing the video into certain parts and assigning a significance value to these parts. In query-based summary extraction, how query terms can be included in the importance value has been investigated. In this study, it was investigated which criteria could be effective in assigning importance value in query-based summarization, and it is suggested that semantic attributes and visual salience maps could contribute. In addition, these concepts are also included in the query terms, since the query terms may be the place where the activity is carried out or the actor performing the activity, rather than just some activities. In the experiments, it has been observed that the inclusion of semantic and visual saliency maps in the diversity term, which is one of the 3 functions included in the optimization, makes a positive contribution. Two other functions considered in optimization are representation and query term relevance. In short, with the thought that the places people look at the video may change when they view the video within a certain task (Task-Oriented Attention), it is useful to predetermine the relevant parts in the video and to give extra weight to these sections in the summaries. Detailed experiments and visual results on two large datasets have demonstrated the correctness of the proposed hypothesis.

Evaluation of specific heat capacity and speed of sound of fluids by using the quantum correction to second virial coefficient with Kihara potential

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In this work, an analytical formula for the quantum corrections to second virial coefficient over Kihara potential is proposed to evaluate correct and precision the specific heat capacities and speed of sound of fluids by using analytical expression. Also, analytical formulae are presented for the first and second derivatives of the quantum corrections to second virial coefficient. As an example, the suggested approach has been applied to Xe, Ne, Ar, N_2, H_2, CO_2, CF_4, C_6H_6, n–C_4H_{10}, and n–C_5H_{12} fluids for the evaluation of the quantum corrections to second virial coefficient with Kihara potential, specific heat capacity, and speed of sound as a function of temperature and pressure. The analytical formula leads to a rapid and correct evaluation and enables fluids precision calculations of thermodynamic properties (entropy, enthalpy, and internal energy) even in complex molecules due to the Kihara potential. Agreement of the obtained results with the available literature data demonstrates that the proposed formulae are accurate and effective.

Encapculation and optimization of freeze dried olive seeds obtained from domat variety in Turkiye

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In this study, response surface methodology (RSM) was used to obtain the optimum conditions for the freeze drying of Domat variety olive seeds of to achieve the desired quality characteristics. The Box Behnken Design (BBD) was applied with three-variable and three replications in the center point. The effects of the different drying parameters including initial temperature of olive seed, pressure and time for freezing on the DPPH activity, total phenolic contents, oleuropein absorbance value of the samples were investigated. Temperature (50-82°C), pressure (0.2-0.5 mbar), time (6-10 hours) were chosen as independent variables. The analysis revealed that, while the temperature of the product prior to lyophilization and the drying time had no statistically significant effect on DPPH activity ($p>0.05$), pressure was more important than the other two variables, and the quadratic effect of pressure and product temperature had significant effect on DPPH activity ($p<0.05$). The R2 and Adj-R2 values of the DPPH activity model were calculated to be 0.8995 and 0.7188, respectively. Encapsulation studies were conducted at freeze dried olive seed those obtained at optimum conditions.

Machine learning powered context identification from a discourse

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Linguistics is heavily reliant on the concept of context. A sentence or passage from a speech or text can be meaningfully interpreted differently depending on where it was uttered. It's not always the contextual elements that pose a problem, but rather how an utterance is understood in relation to its original context. The question of context is both essential and difficult to manage. It has become increasingly common for works to focus on this topic; however, it can also be misleading or misinterpreted depending on the situation.

The relationship between the text and its context is complex and changing in accordance with the approach taken. Many studies have addressed this question, however diversity of perspectives remains an obstacle to understanding how contexts influence texts, leading to many unanswered questions and opening up new areas of research.

Nowadays, anyone with a computer or Smartphone can access this information no matter where they are in the world. This context-rich environment has led to philosophical and existential concerns about ethnic, religious, social, cultural diversity etc. being raised more frequently than ever before. Contextual considerations surrounding discourse have to be taken into account.

In this paper, a new method for the identification of the context of a Discourse or document is presented. This method analyses the content, metadata, and references to other documents in order to identify themes addressed by each one of them. From this information it can then determine what context applies to the document being analyzed. The proposed method is based on language modeling using recurrent neural networks and specifically LSTM models.

Do foreign resources impact how well SMEs function sustainably in the digital world? Evidence from The Gambia

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This study examines the impact of foreign resources on sustainable performance through the mediating role of green entrepreneurial orientation. In emerging economies, the business sector, especially Small and Medium Enterprises (SMEs), has a number of obstacles, including a lack of resources, financial support, and professional skills. Furthermore, SMEs depend on international resources to compete in an unpredictable industry in the long term. A structured questionnaire survey was undertaken to collect data from 500 Gambian SMEs in order to preserve the productive insights. For data processing, a hybrid partial least square structural equation modelling (PLS-SEM) and Artificial Neural Network (ANN) technique was used. The findings show that financial resources have a favorable and substantial influence on SMEs' long-term performance, but technical resources have no meaningful impact on SMEs' long-term performance. Furthermore, green entrepreneurial approach somewhat mediators the association between financial resources and long-term success while totally mediating the link between technical resources and long-term performance. Finally, it runs a sensitivity analysis to confirm the results. The ANN design explains 81% of the suggested model's accuracy. This report offers significant advice to managers, politicians, and other stakeholders about the importance of foreign resources and competencies. It is advised that the Small and Medium Enterprise Development Authority (SMEDA) and the government of The Gambia concentrate more on these chances for long-term performance in order to compete in the worldwide market.

Use of GIS and dasymetric mapping for estimating tsunami-affected population to facilitate humanitarian relief logistics: A case study from Phuket, Thailand

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The 2004 Indian Ocean tsunami led to improvements in Thailand's early warning systems and evacuation procedures. However, there was no consideration of better aid delivery, which critically depends on estimates of the affected population. With the widespread use of geographical information systems (GIS), there has been renewed interest in spatial population estimation. This study has developed an application to determine the number of disaster-impacted people in a given district, by integrating GIS and population estimation algorithms, to facilitate humanitarian relief logistics. A multi-stage spatial interpolation is used for estimating the affected populations using ArcGIS software. We present a dasymetric mapping approach using a population-weighted technique coupled with remote sensing data. The results in each target area show the coordinates of each shelter location for evacuees, with the minimum and maximum numbers of people affected by the tsunami inundation. This innovative tool produces not only numerical solutions for decision makers, but also a variety of maps that improve visualisation of disaster severity across neighbourhoods. A case study in Patong, a town of Phuket, illustrates the application of this GIS-based approach. The outcomes can be used as key decision-making factors in planning and managing humanitarian relief logistics in the preparedness and response phases to improve performance with future tsunami occurrences, or with other types of flood disaster.

Further study of smart voice recognition based on deep learning for depression diagnosis

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Depression is the mental illness with a high incidence rate in society. It affects mood and behavior which leads to various problems such as education, family, and workplace issues. as suicide attempt is often found in severe depressive cases. However, depression is not an untreatable condition. Although, many people do not seek help from psychiatric hospitals because of the long waiting and high fees of the service. Therefore, we create an application that people can do their self-mental assessment just giving a speech regarding their everyday stories while our application is collecting their voice data. In our experiment, we label all voice data obtained from depressive patients as positive class. While we mark all classified non-depressive voice data of university students as negative class. Each audio file has been rendered into spectrograph. It is a visual representation of power spectrum of the Mel frequency-spaced cepstral coefficients (MFCCs) which extracted from the human voice that changes over time. We also do empirical studies between applied DCT and non-DCT spectrographs set including the use of Blackman-Harris and Blackman window functions to create different set of spectrographs of Thai speech dataset. Deep learning models based on the deep residual network (ResNet) are explored to see its potential on classification. Different numbers of convolution layers such as ResNet-34, ResNet-50, and ResNet-101 are examined, respectively. The experimental results show that trained ResNet-50 model from different type of spectrograph can achieve higher than 70% of F1-Score which is the best performance above other approaches. We found that the model learning from spectrograph extracted by Blackman window function with non-DCT algorithm provides the best sensitivity at 74.45% showing. To the best of our knowledge, our approach gives the highest F1-score when compared to the state-of-the-art methods.

M-learning adoption of management students: A case of India

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The present study aims to interpret management student's motivation to adopt m-learning and assesses the determinates impacting the behavioral intent of m-learning adoption. A comprehensive research archetype is proposed by integrating two prominent theoretical models, namely UTAUT and UGT. The research model is tested using multi-analytic structural equation modeling (SEM) and advanced neural network (ANN) approach. The quantitative data was gathered and measured from 220 management students. The study outcomes reported that affective need, performance expectancy, effort expectancy, social influence and facilitating conditions positively impacted the student's intent to use m-learning, whereas cognitive need was found to be insignificant in predicting and explicating the m-learning adoption. The results of sensitivity analysis revealed that effort expectancy showed the highest normalized importance (100%) followed by performance expectancy (97.2%) in explicating the m-learning adoption. The research archetype was able to elucidate 66% of variance in student's intent towards m-learning adoption. In addition to that, Cohen's f-square statistic resulted in effect size as 0.771 indicating that the study findings were relevant and substantial with the empirical data collected. Conclusively, the theoretic and managerial implications are described for the proposed model.

AI aid to assist traffic and road safety

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Road mobility is a fundamental organ in a contemporary society; nonetheless, road accidents cost the world economy about a million lives and billions of dollars each year. Researchers employ machine learning to predict road accidents by applying data fusion techniques to combine social media data, which has a massive amount of geo-tagged data. For example, Twitter has become an increasingly important source of information in many facets of smart societies. Twitter data mining for detection and prediction of road accidents is one such topic with several applications and enormous promise, albeit there are issues associated with large amounts of data handling. This talk presents a deep learning accident prediction model that incorporates information derived from twitter messages as well as additional data such as sentiment analysis, emotions, weather, geo-coded locations, and time information. Our method also addressed the high-performance computing constraints imposed by detector-based accident detection, which required massive data calculation. The results obtained have increased confidence that incorporating sophisticated characteristics aids in the identification and prediction of traffic accidents.

The Influence of the mechanical damage on hollow cylinder under the hyperbolic two-temperature thermoelasticity with fractional order of strain

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This article describes the construction of a two-dimensional thermoelastic, homogeneous, and isotropic hollow cylinder. Without increasing the temperature on the exterior surface of the cylinder, thermal shock is employed to shock the interior bonding surface. Additionally, the two-dimensional equations are regulated by the hyperbolic two-temperature generalized thermoelasticity with fractional order of strain and considerations for mechanical damage. The numerical findings for the rise in dynamical and conductive temperatures, strain, and the average of the principal stress components are graphically presented for various values of the two-temperature parameter, mechanical damage parameter, fractional order of strain parameter, and length of the cylindrical axis. According to this paper, the two-temperature parameter, fractional order of strain parameter, and the length of the cylindrical axis have a significant effect on all functions tested. On the other hand, the mechanical damage parameter has a negligible effect on conductive and dynamical temperatures but has a significant effect on strain and stress distributions.

Experimental novel tracking control for a coupled two-tank MIMO process with comparative studies

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Coupled multiple-tank systems are very attractive for a wide range of civilian and military applications due to their unique features. However, the liquid level control for a coupled two-tank MIMO system is quite challenging because it has strong nonlinearity and coupling, and is very susceptible to external disturbances and small structural variations. A nonlinear optimal control scheme is proposed to address these issues. It consists of a nonlinear model predictive controller (MPC) and a nonlinear disturbances observer. First, an analytical solution of the MPC is developed based on the nominal model under the assumption that all disturbances are measurable. Then, a nonlinear disturbances observer is designed to estimate the influence of a sudden liquid level change. The global exponential stability of the synthesized nonlinear controller has been established through stability analysis. Very challenging experimental tracking control tests including lumped disturbances and comparative study with recent works have been carried out to demonstrate the performance of the proposed observer-control scheme.

Rolling away from the wall into granular matter: From single to cooperative dynamics

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In spite of their macroscopic character, granular materials share some properties with superconducting vortex matter like slow relaxation and avalanches. Other phenomena like crater formation by impact are exclusive of granular matter. However, how a solid object penetrates a granular bed near boundaries has been rarely studied. Here I will describe experiments on the penetration of cylindrical objects into a granular bed near a vertical wall. We find two novel kinds of motion: the intruder separates from the wall as it sinks, and rotates around its symmetry axis. The repulsion is thought to be caused by the asymmetrical loading of force chains, which are stronger between the object and the wall, while the rotation is associated to the tangential friction between the grains and the intruder --a fact that had been neglected in previous research. We introduce simple phenomenological models to explain both motions. Moreover, we show through experiments and computer simulations, the cooperative nature of the penetration of multiple granular intruders near a wall.

Cold RF oxygen plasma treatment of graphene oxide films

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Oxygen radio-frequency (RF) plasma technique is one of the most novel directions used to improve the physical and chemical properties of graphene oxide (GO). Herein, plasma treatment is used to enhance the chemical functionalization and reduced levels of the GO material for electronic and solar cell applications. GO films were chemically synthesized with high quality and uniformity. Then, they exposed to surface modification using RF oxygen plasma at a processing power of 100 W at different processing times. The microstructure and surface chemistry of the GO films were characterized by X-ray photoelectron spectroscopy (XPS) and Raman spectroscopy. Moreover, the effect of oxygen plasma on the thermal stability, surface roughness, contact angle, work of adhesion, wettability, spreading coefficient, and electrical properties have been studied. The results revealed a decrease in the amount of oxygen-containing groups (such as epoxides, carbonyls, and carboxyl groups) from 48.8% in pristine GO to 36.15% after 5 min of oxygen plasma treatment. Besides, the carbonyls groups (C=O) disappeared while new chemical bonds were created compared to the pristine GO film such as hybridized carbon atoms (SP3) and carboxyl's (O-C=O). Additionally, a 38.17% difference has been found in weight loss between the pristine GO and the treated GO at 7 min, which emphasizes the formation of various types of functional groups during plasma treatment. Accordingly, the electrical conductivity increases from 0.11 S/m of pristine GO to an optimum value of 0.46 S/m after 5 min of plasma treatment, as a result of the incorporation of high amount of carboxyl, hydroxyl and carbonyl groups. The current results indicate that the properties of GO can be tuned by varying the degree of oxidation, which may pave the way for new developments in GO-based applications.

Comparative evaluation of the efficacy of aloe vera, cataflam and calcium hydroxide as intracanal medicaments against enterococcus faecalis biofilm

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Aim: To evaluate the antibacterial activity of Aloe Vera, cataflam and Calcium hydroxide ($CaOH_2$) used as intracanal medicaments against Enterococcus faecalis (E. faecalis) biofilm.

Materials and methods: Ninty extracted single rooted teeth were decoronated, mechanically prepared up to k- file 60, autoclaved, contaminated with E. faecalis and incubated at 37°C for 14 days. The teeth were then divided into 3 groups (30 each) according to the intracanal dressing used; Group 1: Aloe Vera, Group 2: Cataflam and a control group: $Ca(OH)_2$. Cataflam powder was mixed with distilled water (1:1w/v), placed inside the canals while Aloe Vera and $Ca(OH)_2$ was injected directly into the canals. The canals were then sealed and incubated at 37°C for 7 days. After 7 days the intracanal dressings were removed by irrigation. Bacterial samples were obtained from the canals using paper points before the application of the medicaments and the number of colony forming units (CFU) was calculated and recorded as (CFU1) then the same procedures were done after the intracanal medicaments application and removal to record (CFU2). The antibacterial action and the percentage of bacterial reduction for the tested medicaments were assessed

Results: Aloe Vera, Cataflam and Calcium hydroxide showed a significant antibacterial activity against E. faecalis ($P<0.001$). However, there was no statistically significant difference in the percentage of bacterial reduction between the three groups ($P=0.372$).

Extraction and characterization of starch from anchote (Coccinia abyssinica): Physico chemical, functional, morphological and crystalline properties

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Starch is a polysaccharide that has an important role in food and other industries. Anchote, a local name for "Coccinia abyssinica" is an indigenous tuber crop to Ethiopia supposed to contain considerable amount of starch. This study aims to extract starch from this plant using sodium metabisulfite (0.025, 0.075 and 0.125% w/v), sodium chloride (0.5, 1.0 and 1.5 M) and water. Anchote starch extracted by using 0.075% (w/v) sodium metabisulfite has presented the highest extraction yield (75.56%) on a dry weight basis. The values of moisture content, bulk density and amylose content of anchote starch were recorded as 11.6%, 0.51 g/ml and 32.14%, respectively. The color of anchote starch was measured in L*, a*, b* values and obtained 89.80, 0.025, 3.63, respectively and whiteness was 89.16%. Its granular shapes exhibited polygonal, semi-oval with some round. The swelling power and the solubility of anchote starch were ranged from (2.15 to 10.6) g/g and (0.51 to 19.15) %, respectively. Syneresis of anchote starch increased when pastes were stored at low temperatures and decline in paste clarity upon storage. Anchote starch exhibited gelatinization temperature; onset, peak and conclusion (68.94°C, 74.99°C and 84.87°C), respectively. Pasting properties of anchote starch; peak, trough, breakdown, final and setback viscosities were recorded as; 4879 cP, 2101.7 cP, 2777 cP, 5636.1 cP, 3535 cP, respectively. Anchote starch showed type B crystalline pattern with 39.15% relative crystallinity. FTIR spectra of anchote starch bands were almost similar with potato starch. The results indicate that this starch may be an alternative source for the production of industrial products that may require starch.

Modeling the impact of climate change on the hydrology of Andasa watershed

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This paper was aimed to study the impact of climate change on the hydrology of Andasa watershed for the period 2013–2099. The soil and water assessment tool (SWAT) was calibrated and validated, and thereby used to study the impact of climate change on the water balance. The future climate change scenarios were developed using future climate outputs from the Hadley Center Climate Model version 3 (HadCM3) A2 (high) and B2 (low) emission scenarios and Canadian Earth System Model version 2 (CanESM2) Representative concentration pathways (RCP) 4.5 and 8.5 scenarios. The largescale maximum/minimum temperature and rainfall data w ere downscaled to fine-scale resolution using the Statistical Downscaling Model (SDSM). The mean monthly temperature projection of the four scenarios indicated an increase by a range of 0.4–8.5 °C while the mean monthly rainfall showed both a decrease of up to 97% and an increase of up to 109%. The long-term mean of all the scenarios indicated an increasing temperature and decreasing rainfall trends. Simulations showed that climate change may cause substantial impacts in the hydrology of the watershed by increasing the potential evapotranspiration (PET) by 4.4–17.3% and decreasing streamflow and soil water by 48.8–95.6% and 12.7–76.8%, respectively. The findings suggested that climate change may cause moisture constrained environments in the watershed, which may impact agricultural activities in the watershed. Appropriate agricultural water management interventions should be implemented to mitigate and adapt to the plausible impacts of climate change by conserving soil moisture and reducing evapotranspiration.

Synthesis, characterization, and intraperitoneal biochemical studies of zinc oxide nanoparticles in Rattus norvegicus

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University of Zabol, Iran

The present work, zinc oxide nanoparticles (ZnO-NPs) were synthesized in the presence of poly(ethylene glycol) which is a biocompatible agent in living systems. The sub-chronic effects of ZnO-NPs were investigated based on biochemical parameters and histological changes applied to Rattus norvegicus. The structural, morphology, and size characterization of nanoparticles were studied by applying techniques as XRD, SEM, FTIR, and TEM. 8-week intraperitoneal injection of ZnO-NPs at a dose of 100 mg/kg leads to significant changes in liver enzymes, malondialdehyde (MDA) content, and tissue histopathological changes. The animal group which was treated with 50 mg/kg of ZnO-NPs presented elevated blood urea nitrogen and creatinine levels, but the liver enzymes and liver histopathology were found to be in normal level. The rats exposed to increasing dose of ZnO-NPs (100 mg/kg) showed necrosis of germinal epithelium and sertoli cells in the seminiferous tubules. The current study clearly demonstrated the dose-dependent toxicity of zinc oxide nanoparticles. ract should give clear indication of the objectives, scope, results, methods used, and conclusion of your work.

Consistent condom use and its associated factors among human immunodeficiency virus-positive pregnant women in Ethiopia

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Background: Consistent condom use plays a significant role in the successful protection of the transmission of human immunodeficiency virus infection in couples with sero-discordant HIV status, mother-to-child-transmission, and acquiring other strains in HIV-positive concordant pairs. Limited data and information about this issue in the study setting. Therefore, this study aimed to assess the level of consistent condom use and its associated factors among HIV-positive pregnant women.

Materials and methods: An institution-based cross-sectional study was done from October 2020 to March 2021. A total of 423 HIV-positive pregnant women were involved and selected using a systematic random sampling technique. Data were collected using a semi-structured, pretested, and interviewer-administered questionnaire and entered into EPI INFO version 7 and analyzed using SPSS version 21. Logistic regressions were performed. P-Value ≤ 0.05 denotes statistical significance.

Results: The prevalence of consistent condom use among HIV-positive pregnant women was 14.2% [95% (CI) 10.9%, 17.5%]. Women having a higher educational status (AOR) = 6.33, 95% CI 1.96, 20.42], women having a CD4 count > 600 cells/mm (AOR = 4.78, 95% CI 2.08, 10.97), women testing positive for HIV during the non-pregnant state (AOR = 5.99, 95% CI 3.01, 11.94), and women disclosing their HIV status to sexual partners (AOR = 4.85, 95% CI 1.71, 13.71) were found to be statically significant with women's consistent condom use.

Conclusion: In this study, consistent condom use among HIV-positive pregnant women was low. Women having educational status of college and above studies, women testing positive for HIV during the non-pregnant state, women disclosing their HIV status to a sexual partner, and women having a CD4 count > 600 cells/mm had better consistent condom use. Hence, giving more emphasis on health education and counseling service about HIV testing before pregnancy, and disclosing their HIV status to their sexual partners and about the need for consistent condom use during pregnancy would be important.

Developing a green building assessment tool for Ethiopia

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Sustainable/green building rating systems are utilized by both developed and developing countries based on their local context. This paper aims to develop an assessment tool that considers the triple bottom line sustainability of buildings. In Ethiopia, buildings of various types and purposes are constructed at an alarming rate with inadequate resources and wasteful uses, so this tool is in urgent need. Developing such a tool is highly appreciated due to the diversified and complicated ecological and socio-economic issues in the building construction sector. This research has developed new green building assessment categories and criteria depending upon consensus reached with 93 experienced experts working on the construction sectors. This research reviewed a total of 10 widely and repeatedly used tools that were critically studied, for instance, Leadership in Energy and Environmental Design, Building Research Establishment Environmental Assessment Method, Comprehensive Assessment System for Building Environmental Efficiency, Deutsche Gesellschaft für Nachhaltiges Bauen, Sustainable Building Tool, and so on. The Analytic Hierarchy Process technique was applied for weighting and prioritizing after selecting these assessment categories and criteria. The outcomes of the research with the relative priority values were materials and resources (18.66%), sustainable sites and ecology (16.92%), energy efficiency (16.78%), indoor environmental quality (12.60%), economic aspects (10.41%), management (10.30%), water efficiency (8.06%) and location and transportation (6.27%). Thus the proposed sustainable building assessment tool that best suits Ethiopian settings was developed.

Facial one-pot synthesis of heteroatom-doped carbon quantum dots for targeted dual modal fluorescent/ MR-imaging and chemotherapy

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Herein, we developed facial greener approach for the synthesis of water-soluble heteroatom-doped Carbon quantum dots (CDs). Doping heteroatom into CDs, not only creates surface functional groups but also changes the electronic distribution. One-pot microwave-assisted synthesis was used for the synthesis of heteroatom-doped CDs: prepared by doping the heteroatom into CDs (B@CDs, P@CDs, and Mn@CDs). As compared to pristine CDs doping phosphorus dramatically increases its quantum yield (QY) from 5.9% to 51.7% suggest that first-rate potential to use as a fluorescent imaging probe. Moreover, to impart specific targeting capability and higher biocompatibility P-CDs were functionalized with hyaluronic acid (HA). In vitro (cell viability) and in vivo (zebrafish) studies revealed lower cytotoxicity and higher biocompatibility. The in vitro fluorescent imaging results in B16F1 cells with CD44-positive-receptors and with receptor-deficient HeLa cells indicate that cellular uptake was based on specific targeting endocytosis methods. Furthermore, the in vivo imaging results of zebrafish confirmed that P-CDs@HA as probe affords paradigm to be applied in basic biomedical research and theranostic applications.

Depression, anxiety and associated factors among people with epilepsy and attending outpatient treatment at primary public hospitals in northwest Ethiopia: A multicenter cross-sectional study

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Haramaya University, Ethiopia

Objective: To assess the magnitude and factors associated with depression and anxiety among people with epilepsy and attending out-patient treatment at central Gondar zone primary public hospitals, northwest, Ethiopia.

Method: An institutional based cross-sectional study was conducted from May - June, 2020 at central Gondar zone primary public hospitals. A total of 589 participants were chosen by systematic sampling technique. Depression and anxiety were assessed by using hospital anxiety and depression scale. Bivariate and multivariate logistic regression analysis was done to recognize variables related to both depression and anxiety. Association was described by using "adjusted odds ratio" (AOR) along with 95% full Confidence interval (CI). Finally, P-values < 0.05 in adjusted analysis were taken as a cut off for significant association.

Result: Out of 556 participants included in the study, 30.9%, 33.1% had depression and anxiety respectively. Being divorced/ widowed (AOR= 2.43, 95% CI, 1.18- 4.99), using two and above number of antiepileptic medications (AOR=1.77,95% CI,1.02-3.09), very frequent seizure frequency (AOR=2.68, 95% CI,1.30-5.51), current substance use (AOR=1.82, 95% CI, 1.03 - 3.22), perceived stigma (AOR=5.67,95% CI,3.14-8.18), and hazardous alcohol use (AOR=2.84, 95% CI,1.32-6.09) were statistically associated with depression. While, being a single (AOR=1.65, 95% CI, 1.04-2.63), using two and above number of antiepileptic medications (AOR=2.27, 95% CI, 1.42-3.62), duration of illness ≥16 years (AOR=2.82, 95% CI, 1.26-6.31), and perceived stigma (AOR=2.49, 95% CI, 1.63-3.82) were statistically associated with anxiety at a p-value < 0.05.

Conclusion: This study showed that the magnitude of depression and anxiety were relatively high among people with epilepsy. Using two and above number of antiepileptic medications and perceived stigma were statistically associated with both depression and anxiety. Screening, early identification and providing appropriate intervention of depression and anxiety among people with epilepsy should be great concern for the health care providers.

Traditional groundwater exploration method for pastoralist community water supply system in semi-arid region of Ethiopia: Case of Tula Sallan Borana, Southern Ethiopia

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Traditionally Borana people used to excavate a little depth in the stream alluvium, to collect the groundwater coming from side to side of outflow and use different purposes in arid and semi-arid regions, where there is no visible flow of water along the streams. In Borana semiarid region of southern Ethiopia, groundwater has been used as the source for almost all individual livestock and other domestic water supply systems. Therefore, the assessment and evaluation of traditional groundwater exploration methods is essential for the pastoral communities in arid zone like Borana of southern Ethiopia. Groundwater exploration method is the technique way to inquiry the ground formations, hydrologic cycle, nature of aquifers, and land cover of the study area. Traditional groundwater exploration method is an indigenous task to identifying the location of groundwater availability. Recently, more techniques have developed to explore the groundwater; classified as surface and subsurface methods. Traditional ground water exploration method is the part of the surface method. Traditional groundwater exploration and supply system in Borana is essential in modern hydrology. Traditionally, Borana explored groundwater by three indigenous methods. Traditional Groundwater Exploration Method for Pastoralist Community Water Supply Systems in semi-arid regions and others requires the basic concepts of position in the subsurface geological setup and natural land cover.

Wireless technologies for social distancing in the time of COVID-19: Literature review, open issues, and limitations

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This research aims to provide a comprehensive background on social distancing as well as effective technologies that can be used to facilitate the social distancing practice. Scenarios of enabling wireless and emerging technologies are presented, which are especially effective in monitoring and keeping distance amongst people. In addition, detailed taxonomy is proposed summarizing the essential elements such as implementation type, scenarios, and technology being used. This research reviews and analyzes existing social distancing studies that focus on employing different kinds of technologies to fight the Coronavirus disease (COVID-19) pandemic. This study main goal is to identify and discuss the issues, challenges, weaknesses and limitations found in the existing models and/or systems to provide a clear understanding of the area. Articles were systematically collected and filtered based on certain criteria and within ten years span. The findings of this study will support future researchers and developers to solve specific issues and challenges, fill research gaps, and improve social distancing systems to fight pandemics similar to COVID-19.

Asian acute coronary syndrome patient mortality and cardiac catheterization risk assessment algorithm using data analytics

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South Asian countries will soon account for more than half of global cardiovascular disease burden. Acute coronary syndrome (ACS) ranks fifth in this region for death and disability. Clinical presentation determines when to treat ACS. In-hospital cardiac catheterization reduces STEMI mortality in low- and intermediate-risk patients. Knowing who needs a cardiac catheterization is crucial in rural South Asia, where cardiologists are scarce. TIMI and GRACE predict STEMI death. TIMI and GRACE use Western Caucasian and limited Asian data. Younger Asian patients with MI have more diabetes, hypertension, and renal failure.

Southeast Asia is genetically diverse. TIMI and GRACE were developed from Western Caucasian ACS patients without reperfusion. Better STEMI mortality prediction improves prognosis. A cost-effective model would identify patients who need early cardiac catheterization. ML-based mortality risk scoring reduces information loss from conventional risk scores. ML based algorithms has been reported to improve post-STEMI mortality in China, Israel, and Korea. The data for study is from the National Cardiovascular Disease Database for Malaysia registry of a multi-ethnic, heterogeneous Asian population for in-hospital (6299), 30-days (3130), and 1-year (2939 patients). The algorithm was developed using SVM and compared to TIMI score. Variables of invasive management improved Asian mortality prediction.

SVM in-hospital, 30days, and 1-year outperformed TIMI risk score (AUC = 0.88 vs AUC = 0.81; AUC = 0.90 vs AUC

= 0.80; AUC = 0.84 vs AUC =0.76). TIMI underestimates mortality risk. By ML algorithm, 90% of non-survivors are high risk (>50%), compared to 10-30% by TIMI.

Identifying mortality risk factors in Asian populations and improving cardiac catheterization patient mortality risk is crucial for clinical care, especially in remote areas with limited resources. No research has used ML algorithms to predict cardiac catheterization risk in an Asian population. This model is crucial in South-East Asia and can be used in other Asian countries

Workers safety and regulating risks of nanomaterials

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Workers in the nanotechnology industry are routinely exposed to health risks of nanomaterials through inhalation, dermal contact, or ingestion. Risks of nanomaterials are often regulated under general regulatory mechanisms for conventional materials. Notwithstanding the pivotal role law plays in regulating risks of nanomaterials and worker's safety, the general regulatory framework applicable to conventional materials may not be appropriate to tackle the unique characteristics of nanomaterials. This paper is qualitative research which analyses the sufficiency of Malaysian occupational and health law in relation to risks of nanomaterials. The main law applicable to workers' safety is the Occupational Health and Safety Act 1994 (OSHA) and its Regulations, which aims to secure the safety, health and welfare of workers and other persons at work against any risks arising out of their activities at the workplace. The law imposes a legal duty on employers to take necessary measures to provide a safe working environment and facilities for workers. The Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000 (USECHH Regulation) also imposes additional obligations on employers where chemical substances are used at work. Chemicals supplied for use at work are subject to Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013 (CLASS Regulation). It appears that the existing regulatory framework is applicable to nanomaterials because it falls under the definition of 'substance' under OSHA and the definition of 'chemicals' under USECHH Regulation and CLASS Regulation, but some provisions are not suitable for nanomaterials. Further, in 2021, Malaysia launched a National Nanotechnology Policy and Strategy 2021-2030 with the aim of creating a dynamic and progressive nanotechnology ecosystem for Malaysia.

Performance of newly developed end mills on advanced materials

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Advanced materials are necessary to use industries like aerospace, energy, petrochemical, and biomedical industries. Nickel based steel alloys, advanced ceramics and titanium alloys offer unique combination of heat resistance, corrosion resistance, toughness, high operating temperature, and strength-to-weight ratio. These materials are termed as ''Difficult to do machining materials'' because of their low machinability rating. Machining of advanced materials causes problems of surface integrity with conventional machining methods. Selection of cutting tool materials is always a challenge for manufacturers to develop good surface finish products. The technology of cutting tools is rapidly improving and this development is necessary to improve the wear resistance and performance of machining on difficult-to-cut materials. Recent developments of new tools, tool geometry and high speed CNC machines provide better options towards machining advanced materials using conventional machining methods, and setting new prospects for essentially widening the scope of implementation. The CNC conventional end milling machining can be implemented to bring up to acceptable surface quality for advanced materials using recent development of cutting tools and resulting in a significant reduction in grinding process and time. This will greatly reduce the overall machining process cost by minimizing or completely avoiding the cost of grinding without compromising the quality of the product. In this speech, newly developed tools are proposed for machining of advanced ceramics and nickel based alloys to improve the machinability. Also discuss the challenges involved in machining of advanced ceramics and nickel-based alloys.

Sustainable fabrication of melt-blown Polypropylene nanofibers for oil-water separation

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Nanofiber is an effective oil-water sorbent for oil spill clean-up operations. However, the production technique to mass-produce nanofibers with high oil sorption capacity is challenging. Nevertheless, the process conditions could be tuned to produce nanofibers to enhance oil sorption. Therefore, this study uses a melt-blowing process to fabricate polypropylene nanofibers by varying melt flow rate, motor speed, air pressure, and die-to-collector distance process variables, of the range; 1 - 5 Hz, 0.15 - 0.45 m for and 0.25 - 0.5 Mpa respectively. The study understands the interaction between process variables and nanofibers' physical properties, such as average fiber diameter, specific surface area, pore volume, and average pore diameter and their relation to oil sorption capacity. Lead ion, pb^{2+} over water selectivity against nanofiber were conducted using Pseudo Ideal Monolayer theory. The SEM and BET characterize the fiber's physical properties and standard methods used to quantify oil sorption capacity. The response surface methodology was used to analyze these interactions. The ranges obtained for average fiber diameter, specific surface area, pore volume, and average pore diameter were 1885.00 - 370.84 nm, 4.3188 - 1.3669 m^2/g, 0.08283 - 0.002143 cm^3/g, and 93.00 – 61.93 Å respectively. It was found that melt flow rate is the most significant factor for all responses, except for average pore diameter. The oil capacity was in the range of 11.37 - 36 g/g. The highest oil sorption capacity induced by fiber entanglement was obtained at 1 Hz, 0.45 M, and 0.5 Mpa. At a low solute concentration, the maximum preference for the Pb^{2+} was at a 9.0 x 10^{-5} mole fraction. The adsorption capacity, Ns was 5.0758 x 10^{-5} mg/g, indicating the selectivity towards Pb^{2+} is high. This knowledge contribution provides avenues for future research in adsorption study for hydrocarbons, oil, and heavy metals.

Synthesizing and characterizing bimetallic nanoparticles for random laser

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We developed rough silver-gold bimetallic nanoparticles for random lasing. Silver nanoparticles were synthesized based on a citrate-reduction method and the gold (III) chloride trihydrate was added to produce bimetallic nanoparticles. Gold atoms were deposited on the surface of the silver (Ag) through galvanic replacement reactions after the solution was stored at room temperature. Sample characterization and a spectrometry experiment were performed where bimetallic nanoparticles with nanogaps and the extinction of the nanoparticles were observed. The aim of this research is to synthesize nanoparticles for random dye laser in a weakly scattering regime. The novel bimetallic nanoparticles were added to Rhodamine 640 solution to produce random lasing. We found that random dye laser with bimetallic nanoparticles produced spectral narrowing and lasing threshold compared to random dye laser with silver nanoparticles. We attribute that to the localized surface plasmon effects which increase local electromagnetic field to provide sufficient optical gain for random lasing. The rough surface of bimetallic nanoparticles also contributes to the properties of random lasing. Thus, we suggest that the rough bimetallic nanoparticles can be used to develop random lasers.

Nascent

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Nowadays, purchasing high-quality water to drink or for any other purpose is expensive. In the history of water, we have not yet developed a technology of water treatment that is both affordable and sustainable. Water experts and businesses involved in the water industry are working hard to develop solutions using macro to nanoscale approaches, but they must make some concessions and limits. Research has been done to evaluate the effectiveness of water treatment plants in removing microbiological pollutants from raw water. Studies have indicated that microbiological pollutants are the main contaminants for water-related illnesses. The most effective and widely used method of disinfection in water treatment around the world is based on chlorine. As the systems have been deteriorating in recent years, there is an urgent need to look at this issue. Studies on the causes and sources of Total Coliform-positive occurrences in the water treatment systems are now being conducted, and they are being done in a methodical and interdisciplinary manner. The majority of the current water quality indicators (WQI) are physio-chemical in nature and do not take into account biological, particularly microbial, based indicators. The paper's goal is to outline a method for revamping the WQI utilising fuzzy logic and neural network technologies. The model might be packed into software and used to create hardware (a hand-held device called a "water analyser") that could be used to evaluate the water quality on-site, hourly, or on any time scale. These techniques have yielded positive results.

A new insight into the cognitivist-constructivism oriented teaching conception

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Background: As there is a paucity of studies investigating teachers tractional teaching conception, the current study is seen as part of attempt to fill this gap.

Methodology: The subjects in the study were 310 University participants-instructors in Socialist Republic of Viet Nam (Vietnam). The survey was implemented with the use of Cognitivist Constructivism-oriented Teaching Conception instrument (CCOTC), including two scales, namely, teachers' beliefs and teachers' intentions of actual practice and the observation.

Results: The findings indicate that at the time of the study, Vietnamese teachers have been departed out of the telling-listening teaching scenario and landing at the soft boundary to the more sophisticated teaching conception with the feature of learners-centeredness.

Significance: The significance of this current study can be portrayed at both national and international level.

The metaverse and how it changes the way we think

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The metaverse is being used and integrated into numerous fields including medicine, industry and education. It can be used for gaming, simulations, social connections and business collaborations. This presentation will look at how the use of virtual reality can impact and change the user. In particular, we will look at two recent studies: the first study, qualitative, examines the effect of a simulation in a virtual world where the participants, 248 students, are wheelchair bound and need to perform various tasks. The students' reflections were analysed, and three themes emerged: feelings while doing the simulation, feelings in the real world, and calls for action. The students felt as if they were disabled in the simulation. This experience changed their attitudes towards disabled people in the real world and made them proponents of change to ensure the rights and equality of the disabled. When they were questioned after a year, the impact of the experience was still strong. The second study examines an intervention using experiential learning and simulations in a virtual world that can promote social proximity, tolerance, and cooperation in diverse societies. The participants in the study were 125 Jewish and Arab students living in Israel. A mixed linear model for repeated measures analysis that included time of measurement (pre and post), ethnicity, and students' age as independent variables revealed a main effect for time for most social groups included in this study; that is, the participants reported more social proximity to other groups after the course, including groups not studied in the course (the LGBTQ community and people of color). The results of the studies suggest that experiential learning has considerable potential in the field of education to help students question their prejudices, and experience being someone else, thus reducing stigmas and racism.

Performance evaluation of coated carbon foam material in heat exchanger applications

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Recently, carbon foam material draws the researchers' attention due to its outstanding thermomechanical properties. Coating carbon foam with higher conductive material can enhance such properties. The overall reduction in the size of electronic components has led to high power dissipation and the necessity for innovative cooling designs. The present work is an experimental study conducted to use several types of pristine and coated carbon foams as a heat sink and heat exchanger in a thermoelectric cooler (TEC) for cooling vest application. The types of used foams are low and high thermally conductive materials. Various parameters were measured and calculated to investigate the performance of carbon foam. Such parameters are the weight, the effective thermal conductivity, the mass flow rate, and the outlet temperature for both the heat exchanger and heat sink in addition to their temperature difference. The results from this work were compared to a previous study conducted on Aluminium fins. The results showed that the coating technique improved the thermal conductivity of the foam with low thermal conductivity more than the foam with high thermal conductivity. The performance of carbon foam was much better than aluminum in dissipating heat, especially for the high thermal conductive carbon foam. The largest weight value of the foam was around 70 % of aluminum fins, while its thermal conductivity was 300% more. The foam has the potential to radically improve heat transfer, thereby reducing the size and weight of equipment while simultaneously increasing its efficiency and capabilities. Using carbon foam as the core material for this application, the effective heat transfer was significantly increased while reducing the size and weight of the heat exchanger.

Documenting endangered maritime heritage in Libya: The first phase of the Cyrenaica Coastal Survey Project (CCS)

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Cyrenaica is a fairly large territory located in the north-eastern part of modern Libya. It occupies an area of about 309,000 km^2, extends about 643,700 km E-W and 480,000 km N-S from the so-called Gulf of Sidra in the west of Libya to the great Catabathmus (modern-day al-Salloum in the north-west of Egypt) in the east. There are at least five principal cities in this region, which have massive and visible monuments, and have all seen some level of archaeological investigation (Cyrene "modern Shahat or Grenna", Apollonia "modern Susa", Ptolemais "modern Tolmaita", Taucheira Arsinoe "modern Tocra", and Euesperides or Berenice "modern Benghazi".

Over the millennia the peoples who lived along the coast of Cyrenaica have left some remarkable evidence of their occupation, most visibly from the Hellenistic to early Islamic periods, when Cyrenaica was closely linked to the rest of the Mediterranean world by seafaring trade.

The Cyrenaica Coastal Survey (CCS), is a collaborative project between the Maritime Endangered Archaeology project (MarEA, based at Ulster University and Southampton University) and the Department of Antiquities (DoA) of Libya in partnership with the Universities of Al Bayda and Benghazi in Libya. The Project records the current condition of maritime sites along the Cyrenaican coast.

This presentation focuses on the results of the first phase of the project, which was carried out between ancient Phycus (modern Zawiet el-Hamama) and Kainopolis (modern Al-Ogla).

The main objectives of the first phase of the project were to visit and record the archaeological sites located in the survey area, assess their current condition, and record the damages and threats they face.

In this phase of the project, 72 archaeological sites were recorded, including 14 main sites and 58 sub-sites. In addition, the underwater team conducted a survey on 3 of these sites to explore, photograph and record as many submerged archaeological features as possible. The results of the first stage of the Cyrenaica Coastal Survey provides a snapshot of the factors of damages and threats that coastal heritage faces in Libya.

Lung cancer data analytics using hybrid ECNN and ERNN techniques

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Malignant growth is viewed as perhaps of the most perilous sickness arising in the cells of human assemblage. Cancer of Respiratory organ in the lungs are viewed as an individual of malignant growth have been impacted most of the populace. Discovery of cellular breakdown in the lungs is a troublesome undertaking as there has all the earmarks of being a tiny development called knob once disease influences the lung. Early recognition of cellular breakdown in the lungs can consequently be a useful guide for individuals impacted of illness, the specialists & clinical staff giving them. In our findings, a profound encyclopedism hybrid method is ECNN-ERNN with autoencoders is proposed for the recognition of cellular breakdown in the lungs. The dataset is made by gathering images from different open-source and online entrances that force no limitations on use, in any event, for business purposes, thus giving a more secure way to utilize and spread such information while developing and conveying any sort of ML models. Further, we propose and assess a changed ECNN-ERNN model, which incorporates two unmistakable examinations: Study One and Two. Our exploratory computational outcomes show that our recommended model can distinguish Lung Cancer patients with an exactness of 96±1.8% (AUC = 95.2) and 89±0.8% (AUC = 0.877) for Studies One and Two, separately. Furthermore, we make sense of our model's expectation and element extraction using Extended Deep Learning Techniques (EDLT) serves to a more profound knowledge of explicit highlights that describe the beginning of the Lung Cancer infection.

The proposed model outperformed the existing system with parameters/metrics as accuracy (82.42%), error rate (0.13), val_loss (0.41), val_accuracy (0.50), size of dataset used in research (1.50 GB), No. of epochs (30), Time-complexity (O(n2)) and execution time (1022 ms).

Developing sustainability assessment indicators for measuring contractor's performance during the construction phase of construction projects in Jordan

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The development of sustainability assessment indicators has become a hot topic globally, while sustainability practices are uncontrollably growing in the construction industry. However, the construction industry itself has negative impacts on the environment, society, and the economy. Therefore, during the construction phase, the contractors who are responsible for delivering construction projects should have a suitably adaptable sustainability solution. Qualified and experienced contractors are, of course, vital for the success of construction projects, and measuring their performance with respect to sustainability during the construction phase is crucial. However, there is currently very little evidence of a comprehensive and integrated assessment approach. This research aims to properly devise a smoother development process and improve potential deliverables for the construction industry in Jordan. A list of sustainability assessment indicators was developed for use during the construction phase, to assess the performance of the contractors, using a review of the literature, surveys, and by drawing upon expert opinion. As a result, 78 indicators have been formulated, across the five major dimensions of environmental, social, economic, lean manufacturing, and cultural, all of which influence contractor performance regarding sustainability practices.

The instrumentalization of territorial identity in the service of attractiveness: A benchmarking approach

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Faced with the imperatives and challenges of globalization, territories and players are currently called upon to adopt innovative approaches and strategies for attractiveness, in order to be able to attract and retain all forms of establishments likely to bring value to the territory.

It is in this context that territorial identity currently intervenes, as a factor of attractiveness which makes it possible both to federate and mobilize local actors around a common objective, but also to differentiate and position the territory by compared to its competitors.

Indeed, over the past two decades, a new paradigm has emerged in the field of public management, which advocates place identity as a determining element of territorial differentiation, recognition and commodification.

This new trend has marked the beginning of a new paradigm where the territory is no longer confined to the sole functions of production and residence, but is considered as a constructed space resulting from a collective process.

By strengthening social cohesion and the feeling of belonging, territorial identity helps to boost the image of the territory and above all to guarantee coordination between its different economic sectors.

Thus, the central question addressed by this article is to understand how the instrumentalization of territorial identity is currently being done to serve attractiveness.

To answer this, we will first proceed to a definition of the concepts of attractiveness and territorial identity, in order to establish the links that unite them and the resulting implications.

Secondly, we will try to approach and understand the different strategies currently deployed by public management, to use identity for attractiveness and competitiveness objectives.

Development of new electrode materials based on 2D black phosphorene for high energy density Li-ion batteries

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Black phosphorene, as the first two-dimensional phase of phosphorus, has grabbed a great deal of interest due to its fascinating intrinsic properties, including in-plane structural anisotropy, finite band-gap, and high carrier mobility. These features make it a viable candidate in extensive applications. However, as both experimental and computational works show, the air sensitivity of phosphorene remains the major challenge facing its large-scale production, which seriously hinders its incorporation into practical devices. To unravel this thorny issue, extensive research has been conducted over the past few years, aimed at understanding the atomic-level chemical degradation of phosphorene as well as possible chemical and physical passivation strategies. Here, we provide an in-depth review of recent theoretical and experimental advances in the proposed degradation mechanisms and plausible methods devoted to addressing phosphorene air instability concerns. Special attention is given to recent research efforts on passivation techniques in addition to exploring the advantages of using phosphorene as a new candidate in advanced battery negative electrodes. Finally, an insightful outlook of opportunities, prospects, and challenges of phosphorene stability towards long-term utilization is cast.

Modeling large-scale solar desalination with membrane distillation driven by concentrated solar power plant

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One of the biggest problems in the world is the scarcity of water and electricity. To meet rising demand, researchers are concentrating on integrated power and desalination plants. The majority of research has concentrated on fossil-fuel-fired power plants; however, few studies have considered solar energy for it. For this, a techno-economic and sensitivity analysis of seawater desalination using solar energy is investigated in this work in the coastal region of Morocco. The CSP part consists of a large-scale parabolic trough technology using VP1 as heat transfer fluid, integrated with a Rankine cycle power block by using seawater as cooling fluid in the condenser. As for the desalination part, it consists of a Direct Contact Membrane Distillation System based on heat and mass transfer equations, and is solved numerically by MATLAB software; The study's findings revealed that The CSP plant's electricity generation increased as DNI increased, the annual energy production and the annual water usage was 322.77 GWh and 1,088,717 m^3 respectively. The real and nominal Levelized cost of energy was discovered to be 13.61 ¢/kWh and 17.04 ¢/kWh respectively. While, the desalination System unit's freshwater production is low in winter and high in summer, which is completely reasonable as it is directly linked to the amount of solar irradiance the freshwater production cost is around 0.98 $/m^3$.

A structure preserving finite volume method for surface water flows with transport processes

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In this study, we develop a well-balanced positivity-preserving unstructured numerical method for modelling the coupled system of shallow water flow and solute transport with source terms due to variable bottom topography, bottom friction effects and diffusion. New well-balanced positivity preserving discretization techniques are developed for the water surface elevation and the scalar concentration. In the absence of source terms of the passive pollutant, the constant concentration states are preserved in space and time over complex topography for any hydrodynamic field of the flow. Novel discretization technique for the diffusion term is proposed to ensure the positivity of the scalar concentration. Piecewise linear reconstructions techniques are proposed for the water surface elevation and concentration to ensure the discrete maximum-minimum principle for the solute concentration. Our techniques are validated using numerical examples, where we test the well-balanced and positivity properties of the proposed numerical method and its robustness in predicting the solutions of the coupled model of shallow water flow and solute transport.

Effect analysis of U-shape exterior walls on energy consumption of building: The case of Morocco

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The building architecture significantly affects the energy consumption of buildings. In this paper, we study the effect of using U-shape exterior walls on energy consumption. The main target is to evaluate the impact of this parameter on heating and cooling loads for a small building model in Tetouan, Morocco (an administrative building divided into 2 zones, the effective area is 27 m^2). In this context, a parametric study was carried out by the TRNSYS software 18, in order to evaluate the efficiency of using this form of exterior walls according to two selected criteria: the orientation of the exterior wall and the depth of the U-shape. More precisely, five values of the U-shape depth were studied for each orientation (South, North, South-east, and South-west), in six climate zones in Morocco presenting different climate conditions. In this sense, 126 simulations were done to have as a result the heating and cooling load for each scenario. The results showed a significant difference in the total load of the building model using different depths of the U-shape exterior walls in different orientations. We found that the U-shape parameter modified in the exterior walls is more efficient in zones characterized by a cold to moderate climate, namely, Ifran, Rabat, and Tangier (the maximum reduction of heating and cooling demand varies from 3.6 to 14% depending on the climate zone). Also, a maximum reduction in the total heating and cooling consumption is noticeable in zones with a hot climate which fluctuates between 1.9 and 3.1%.

Characterization of the incorporated $ZnAl_2O_4$ doped with Sm^{3+} nanopowders into PCL matrix

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This study aimed at investigating the effects of $ZnAl_2O_4$ nanopowders on polymer-based nanocomposites. The nanopowders were synthesized by the precipitation method. The nanopowders were distributed into the polymer matrix via solution casting to prepare nanocomposite films. The nanocomposites films were studied for their structure, morphology, optical, luminescence and thermal properties. The X-ray diffraction (XRD) confirmed the orthorhombic for semi-crystalline PCL and cubic structure $ZnAl_2O_4$ nanopowders in the prepared nanocomposite films. The morphology changed from aggregated particles to smaller homogenous spherical-like structures. The differential scanning calorimetry (DSC) showed that the degree of crystallinity of nanocomposites films increased in the presence of the nanopowders. Nanocomposites displayed poor thermal stability compared to the polymer. Photoluminescence (PL) showed improved luminescence intensity of nanocomposite films compared to the polymer.

Laser additive manufacturing of metal alloys for industrial applications

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Laser enabled additive manufacturing of functional alloys has gained great interest due the ability to print-on demand using various materials. The advantages of the technology include increase complexity, reduction is part weight and an ability to print difficult materials such as titanium alloys and high entropy alloys. The work will address the powder bed fusion of AlSI10Mg and Ti-6Al-4V and the direct energy deposition of high entropy alloys from design, materials, processing, and post processing, which includes heat treatment and surface polishing, with the aim to develop parts that are ready for industrial applications. The CSIR has developed in-house capabilities in building metal 3D printers and the results obtained in the optimization of these systems will be showcased in this presentation. The results will include metallurgical analysis, X-ray diffraction analysis, X-ray photoelectron spectroscopy, electron backscatter diffraction, tensile, fatigue and fracture properties analysis. Data analysis has revealed that the additively manufactured samples properties were comparable and, in some instances, better than the conventional manufacturing methods. The results have led to multiple parts being 3D printed on our machines for industrial applications in the rail, energy and aerospace industries in South Africa.

p-Toluenediamine hair dyes induce cellular proliferation and genotoxicity

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The p-toluenediamine (TDA) is a precursor agent, which is widely used in oxidative hair dye formulations. Its oxidant form reacts with one or more couplers in an alkaline medium to produce a certain color. During application, topical products can be absorbed, leading to systemic effects in the organism exposed to them. To assess the toxicity of the penetrated part, five oxidative hair dyes containing p-toluenediamine sulfate as the precursor were analyzed invitro. The selected dyes were the most widely used brands in the markets. The solutions of the dyes which represented the absorbed part of the hair dye were prepared by Franz cell. Varied concentrations of solutions dyes were added to the human kidney cell line (HEK293T) to evaluate the cytotoxicity and genotoxicity. The cytotoxic effect was measured by Thiazolyl Blue Tetrazolium Bromide assay (MTT assay), whereas the genotoxicity was detected by Micronucleus test. The MTT assay showed inducing cell proliferation exposed to different hair dye solution safter incubation for 24 hours. The induction was significant with formulations 1,3,4, and 5. The maximal growth reached 180% with hair dye 1, while the decrease in growth rate appeared with hair dye 2. Micronucleus test on HEK293T cell line showed a significant increase in the number of micronuclei in all treatments with different potencies according to the formula. The micronucleated cells ranged between 2.5-4.2-fold compared to the control. The highest value appeared with hair dye 3, with micronucleated cells approximately 4.2-fold; in contrast, the increase was the lowest with hair dye 2. Therefore, hair dye - 2 did not show ability to induce proliferation and micronucleated cells significantly, so it was considered the least genotoxic among the studied hair dyes. In conclusion, the absorbed amount of hair dye containing TDA could induce the growth rate of cells and cause a genotoxic effect.

Analysis of the performance of natural dyes as sensitizers in solar cells

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Our study aimed at analyzing the performance of natural dyes as sensitizers in dye-sensitized solar cells. It was guided by two objectives: to analyze the dependence of the power conversion efficiency of the solar cell on the type of dye; to assess if the power conversion efficiency of the solar cell is dependent on the pH of the dye. It was conducted at Mbarara University of Science and Technology electronic laboratory. Dye-sensitized solar cells were fabricated using natural dyes extracted from Aloe Vera, Wandering Jew, and Close Up Red Flower. Other materials include: titanium (IV) oxide nanopowder (TiO_2) - 21 nm particle size (TEM), ≥ 99.5 % trace metals basis (Evoniks Aeroxide P25); sodium hydroxide (NaOH) and one molar dilute nitric acid as reagents; Triton X-100 as a binder, one molar potassium iodide solution as the electrolyte, distilled water as an extracting solvent, Pilkington TEC glass lite, 2.5 cm × 2.5 cm × 3 mm with an active area of 4.0 cm^2 selected as the substrate for TiO_2 and graphite films; pipette, filter papers, binder clips, and tape.

It was found out that for each of the three dyes extracted, the peak efficiencies of the DSSCs were all about the same (for Aloe Vera it was 4.2×10^{-7}; for Wandering Jew it was 5.2×10^{-7}; and for Close Up Red flower it was 4.3×10^{-7}), though these peaks were attained at a different pH for each dye (pH 9.39, 5.46, 7.08, respectively). These results agree with Shanmugam, Manoharan, Anandan, and Murugan (2013) that dyes have different power conversion efficiencies. It was concluded that the type and pH of the dye used to fabricate a solar cell has a great effect on its performance.

Use of biomass fuels predicts indoor particulate matter and carbon monoxide concentrations; Evidence from an informal urban settlement in Fort Portal city, Uganda

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Background: Poor indoor air quality IAQ is a leading cause of respiratory and cardiopulmonary diseases. Particulate matter PM2.5 and carbon monoxide CO are critical indicators of IAQ, yet there is limited evidence of their concentration in informal urban settlement of Uganda.

Objective: This study we assessed household characteristics that predict the concentrations of PM2.5 and CO within households in an informal settlement in Fort portal city in Uganda.

Method: cross-sectional study was conducted in 374 household. Concentrations of PM2.5 and CO were measured using a multi-purpose laser Particle detector and a carbon monoxide IAQ meter, respectively. Data on household characteristics were collected using a structured questionnaire and an observational checklist and data were analyzed using STATA version 14.0. linear regression was used to establish the relationship between PM2.5 CO concentrations and household cooking characteristics

Result: The majority (89%)332/374) of the households used charcoal for cooking. More than half (52%,194/374) cooked outdoors. Cooking areas had significantly higher PM2.5 and CO concentrations (t=18.14≤ 0.05) and (t=5.77p≤), respectively. Cooking outdoors was associated with a 0.112) increase in the PM2.5 concentrations in cooking area (0.112) 95%Cl 0.069,1.614, P=0.033). Cooking with moderately polluting fuel was associated with a 0.718 increase in CO concentrations (0.718)95% Cl 0.084,1352, P=0.027) in the living area.

Conclusions: The cooking and the living

areas had high concentrations of PM2.5 and CO during the cooking time. Cooking with charcoal result in higher CO in the living area. Furthermore, cooking outdoors did not have a protective effect against PM2.5 and ambient pm2.5 exceeded WHO AQ limits. Interventions to improve the indoor air quality informal settlement should promote a switch of cleaner cooking energy and improvement in the ambient air quality.

Wind flow numerical modeling for solar energy generation in Uganda's tropical regions

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The goal of this study is to better understand how wind movement affects solar energy production in tropical regions. Wind behavior in a particular area is influenced by a variety of factors, including the local climate and topography. Therefore, it is essential to have a full understanding of the wind pattern and distribution before installing a solar facility in a given area. In its simplest form, wind is the airflow produced by the Earth's atmosphere as a result of the Sun. By controlling its surface temperature during the conversion of solar energy to electrical power, the wind speed effectively cools the photovoltaic generator's surface naturally. The modeling and navigation of solar electric power potential and generation in Uganda's four regions was intended to maximize the use of the country's enormous renewable solar energy resources by combining the electricity they produce with existing renewable hydropower and conventional power generation to increase the nation's grid supply and expedite the achievement of sustainable development goals. In order to identify the hotspots with the highest likelihood of sunshine hours, clearness index, and wind speed for solar deployment, a comprehensive research of the climatological and meteorological distribution among the four regions of Uganda was conducted. Microsoft Excel, Matlab/Simulink, OriginLab 8.0, and PVGIS were used to implement the numerical solution. Tropical regions are where the distribution of solar energy is created. According to the results of the error analysis using the statistical indicator RMSE, the model's performance for locations in the central and western regions has values of 0.8215 and 6.4186, respectively. The outcome also showed that solar power generation is reliant on how well the photovoltaic generators are cooled. According to the outcome, solar facilities should be placed in areas with greater solar power distribution and solar power should be sent to areas with less solar power distribution.

Optical and electrical properties of nanocomposite (polyvinyl Alcohol/CdO/NiO) fabricated by sol-gel method and their anti activities for three type of bacterial

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In this research, synthesis of Optical and Electrical properties of (CdO/NiO) nanocomposite via Sol-Gel method. The NiO and CdO nanoxides in (PVA) as well as the (PVA/CdO/NiO) mixture were prepared in five samples with different concentrations where the ratio of (CdO/NiO) was [(1: 0), (3: 1), (1: 1), (1: 3), (0: 1)], by using the gel solution by means of a polyvinyl alcohol solution (PVA). The samples were platelimb at (500°C) for three hours. The structural properties of the prepared oxides resulting from the cracking process were studied. Optical measurements and absorption spectra were taken at wavelength (215 nm) within the UV range. The results of the optical measurements showed an increase in the energy gap of the mixture. Samples were taken for continuous electrical conductivity measurements. It was found that the highest conductivity was in the sample (S3), which reached (0.394 Scm). and the biological efficacy sensitivity of the samples was tested on three types of bacteria. The samples showed varying efficacy on the three types, all of which were highly influencing the samples of the bacteria under study. From the results, increase in the energy gap of the samples. The increase in the energy gap is due to the discordant interaction between the unfilled states at the lowest edge of the conduction band of the CdO with the highest edge of the valence band of (NiO) which is the donor-like level of (CdO) as a result of mixing. The higher the (NiO) concentration inside the sample, the more electrons are at the d-level. Thus, the repulsion between the electrons of the lowest conduction band of the CdO and electrons of the highest valence band for (NiO) Which increases the widening energy gap of the mixture.

Changes and opportunities of building community resilience in communal areas of Southern Zimbabwe

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Resilience building concept has increasingly been embraced as a framework for disaster resilience and as result policies are being initiated which support resilient community programmes. Climate change adversities have intensified community vulnerability to hazards and undermined households' capacities to withstand disasters sustainably. Building community climate resilience has presented various challenges and opportunities to the exposed communities. This study seeks to analyze the challenges and opportunities obtained when building community resilience in communal areas of Mwenezi District. The initiatives were implemented through the Enhancing Community Resilience and Sustainability Project (ECRAS) led by CARE and PLAN International targeting to increase communities' capacities to withstand shocks and stressors and also enhance livelihood options. A mixed method approach which utilized both qualitative and quantitative techniques was used. The choice of two approaches was based on a phenomenological constructivist belief that problems are best solved using multiple sources. The qualitative approach depended on questionnaires, interviews, focus group discussions and direct field observations. The quantitative approach depended on closed ended questions and use of statistical package for social scientists (SPSS version 25.0) for data analysis. The research established several challenges being obtained when building community climate resilience. Some of the challenges included ignorance, lack of technical know-how and lack of financial resources to buy resilient inputs on the side of communities. To the implementing partners it was established that resistance and shortage of resources are some of the challenges being encountered. Building climate resilience has enhanced dietary diversity of exposed communities, food security status, income generation and livestock production. Therefore building climate resilience is a critical strategy for substantially managing climate change adversities and as such the Strategic Sustainable Resilience Framework developed is expected to foster successful implementation of resilience interventions through managing challenges obtained. The study recommends continued implementation of more climate resilience strategies to improve livelihoods of at risk communities.

Assessment of land use change in the wetland of barotse floodplain, zambezi river sub-basin, Zambia

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Barotse Floodplain (BFP) has been vulnerable to land use change consequently threatening wetland degradation albeit it being a Ramsar Cultural Heritage Site. This study aimed at determining the extent of land use change in BFP in the selected years between 1980 to 2020 using Landsat data, then identifying and assessing drivers of land use change using survey data sets. In this study we hypothesized to determine the past and present status of the floodplain. The study used integrated research approach to collect and analyse data. Primary data was collected using interview schedule, key informants' interviews, Participatory Rural Appraisal (PRP) and field observations. Secondary data was searched from archival sources. The proportional random sample size of 270 heads of households from 9 districts found in the study area was selected. The study found that there was an average land use change of 24.3 percent and 0.78 annual change rate. The annual land use change rates per classes were: forest/woody vegetation (0.32), grassland (0.07), water (0.02), annually flooded land (0.11) and bare land (0.26). The delineated land cover area classes have been reducing except for bare land, that was increasing. Water class had the greatest negative percentage change (decrease) of 0.04. While the class of bare land class had greatest positive change (increase) of 8.3 percent. The study found that land use change was driven by climate variability (48.5 percent), infrastructure development (20.7 percent), technology (7.8 percent), demographic (18.5 percent), and agriculture (4.4 percent). The study further found that there was a Pearson Coefficient relationship of 0.27 between driving forces of land use change and observed land use changes pattern connoting land use change. The study recommends strategies such as environmental education and land use planning to resolve the problem of land use changes, in order to contribute to sustainable wetland management.

Photocatalytic degradation of azo dyes in textile wastewater by Polyaniline composite catalyst

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Azo dyes in industrial textile and dye effluent (5–30%) have become irresistibly recalcitrant and toxic to both treatments and the environment respectively. Global concerns about the persistent nature of these dyes and the limitation of the conventional treatment currently in place have led to this critical analysis and evaluation of the photocatalytic approach using nano-technology. The review of literature has indicated that although this approach is effective, however, the limitation of frequent electron-hole recombination during the process coupled with challenges of agglomeration of nano particle powder, photo-corrosion and photosensitivity of the various nano-materials are still challenges associated with the development of polymeric based nano composite catalyst of polyaniline (PANI). The unique features of incredible charge transport properties, surface morphology and enhanced functional properties gave PANI the choice of use among other conductive polymers for composite fabrication with materials such TiO_2 and ZnO_2, Graphene oxides, CNTs. Photoactive properties, conductivity mechanical, thermal and chemical stability equally offers the polymer the propensity of bandgap tunability when in composites with other materials. Consequently, effective recovery and reuse of the composite catalyst for more than four runs with efficiency > 90% becomes obtainable. These appreciable advantages offer fabricated nano composite polymeric-based catalysts an effective outlook of use in the remediation of toxic azo dyes industrially as compared to the bio-catalyst and pure nano adsorbent materials. Therefore, the review discusses the treatment process for azo dyes, fabrication and performance evaluation of improved composite catalyst of PANI as an alternative to the conventional catalyst in wastewater and recommends for further investigation in PANI to enhance treatability of azo dyes.

Geologic review of hydrocarbons potential of the Rufiji Basin, Tanzania

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The Rufiji Basin is one of the underexplored and least studied basins in the coastal Tanzania, despite the occurrences of oil and gas seeps that indicate the presence of a working petroleum system(s). Consequently, geology and distribution of key petroleum elements and hydrocarbon potentiality of the basin remains poorly understood. This study presents a geological review of the hydrocarbon potential of the Rufiji Basin based on a synthesis of published and unpublished reports of multifaceted studies in the basin, coupled with very limited additional data collected in the course of this study. This review identifies three petroleum plays (play I, play II, and play III) along with associated components, and includes: hydrocarbons play I, which constitutes a Permian–Triassic source rocks that are characterized by kerogen type III with TOC of ~ 6.1 wt% and Tmax values of 465 °C, along with Permian–Triassic fluvial–deltaic sandstone reservoir units, with porosity varying from 7 to 18%; and a Bajocian (restricted marine shales) as a seal. Play II has Bajocian restricted marine shale source rocks that are correlated to kerogen type II/III and III Makarawe shales, which have an average TOC of 1.7 w% and Tmax of 450°C and is marked by Middle Jurassic carbonate reservoirs with an average porosity of 15%, capped with mid-Late Jurassic marine shales. Play III is characterized by Campanian shales as source rocks, Early Cretaceous fluvial–deltaic sandstone reservoir with a porosity of 15–20%, and is capped by Late Cretaceous transgressive marine shales. The analyses indicate that plays I and II are particularly more prospective, as manifested by the gas reserves discovered in offshore Songo Songo Island, making a Rufiji Basin a viable potential basin for hydrocarbon generation and accumulation. The findings of this review study support follow up exploration activities and researches, which can ultimately lead to a commercial discovery oil reserves in the basin.

Can high-performance work practices influence employee career competencies? There is a need for better employee outcomes in the banking industry

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In order to boost organizational growth and expansion in the modern world, businesses must prioritize investing in and enhancing employee accomplishments. However, most firms prioritize management objectives over employee career competencies. A thorough review of the literature found that there has been no research on high-performance work practices (HPWS) and other organizational elements in Tanzania. The expanding interest in the HPWP subject reflects the fundamental objective of most commercial organizations, which is to develop and raise corporate value through improved creative and additional performance and service quality. This incorporates the context proper for HPWP to provide significant strategic benefit to Tanzanian financial industries. It is essential for organizations to invest and improve employee outcomes to enhance organizational competitiveness and growth in today's world. However, most organizations place management objectives above the career competencies of employees. Therefore, this study investigated 1. the effect of high-performance work practices on employee career competencies in the banking industry. 2. the mediating effect of employee career competencies on the relationship between high-performance work practices and employee outcomes in the banking sector. The study adopted a quantitative approach with a total of 340 responsesdents from various banks in Tanzania. The data was analyzed using Covariance Based Structural Equation Modelling (CB-SEM). The results of the finding indicate that high-performance work practices have a significant effect on employee career competencies. Similarly, employee career competencies significantly impact service quality, creative performance, and extra-role performance in banks. Also, employee career competency does not mediate the relationship between high-performance work systems and service quality in the banking industry.

An indigenous knowledge and STEM integrated approach to the decolonisation of science curricula

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Globally, the knowledge economy of today is pushing many nations to spearhead socioeconomic transformation through integrated science curricula approaches. Curriculum reforms that tap from both indigenous knowledge (IK) and Science, Technology, Engineering, Mathematics (STEM) education is gaining momentum. In Africa, these reforms, which promote the development of the twenty-first century competencies in learners through Afrocentric science curricula form part of the larger worldwide decolonising the curriculum agenda. IK and STEM integrating teaching allows learners to indigenous and western knowledge paradigm borders cross. This is a key development of African economies strategy. What IK and STEM integration might mean, however, for teachers, teacher trainers, and communities, is not at all clear. Grounded on a conceptual framework that draws from culturally responsive STEM education and the tetrahedral model of chemistry, this paper explores the socioeconomic transformation potentials of Afrocentric science curricula through addressing the following questions: How can chemistry educators integrate indigenous and STEM knowledge? And, how can this promote the decolonisation of the mainstream science curricula and socioeconomic transformation in Zimbabwe? The study adopts a documentary research approach. Initial findings insights that the integrated IK and STEM knowledge teaching approach to chemistry is a complex endeavour to accomplish within the curricular implementation time frames. The study further reveals that professional capacitation can help educators better IK and STEM integrate specific topics, while also addressing contemporary concerns about critical skills gap hinged on limited learner competencies and under representation in STEM fields. The paper insights on the need to capacitate science educators for educational institutions to uphold their socio-economic transformation mandate.

Double synergetic effect of strengthening polymer nanocomposites based on the cluster model of the amorphous state of polymers

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In this article, the object of research is an in-field pipeline. As a composite material for corrosion protection of pipelines, a composite material with the composition epoxy resin (ED-20)/styrene-butadiene rubber (BSK) and nanomedium as a filler was adopted.

The polymer under study is considered as a natural nanocomposite; a cluster model was used to describe the structural features of its amorphous state. Now almost all researchers recognize the existence of a local order (clusters) in the amorphous phase of a glassy polymer.

According to the cluster model, a mesh polymer consists of two components – a loosely packed matrix and nanoclusters, the latter playing the role of a nanofiller, and a loosely packed matrix – the role of a matrix of a natural nanocomposite. Based on fractal estimates of the surface of nanoclusters, we previously established the dependence of the volume fraction of the loosely packed matrix on the temperature of the composite and showed that the dimensional effect of nanoclusters is identical to the corresponding effect of dispersed filler in artificial polymer nanocomposites, namely: a decrease in the number of statistical segments in one cluster and the radius of clusters increases the degree of amplification (modulus of elasticity) of the natural nanocomposite. Using a fractal model of interfacial interactions, estimates of the threshold values of the volume fractions of nanoclusters of an epoxy polymer matrix and metallic filler nanoparticles are obtained, during the transition through which the process of mechanical stress transfer from the polymer matrix to the filler weakens.

One of the main tasks solved when introducing fillers into polymer matrices is to increase the rigidity of polymer nanocomposites, which is characterized by the magnitude of the elastic modulus. In the case of treating the polymer as a natural nanocomposite, the dimensional effect of nanoclusters, identical to the specified effect of dispersed nanofillers in polymer nanocomposites, plays an important role: a decrease in the size of both nanoclusters and dispersed particles leads to a sharp increase in the degree of amplification (modulus of elasticity) of the nanocomposite.

Based on the upper and lower estimates of the elastic modulus of the nanocomposite matrix, a double synergistic effect of strengthening the elastic modulus of the nanocomposite was identified and quantified as a superposition of the amplification effects from an inorganic filler and from nanoclusters playing the role of a filler of a loosely packed matrix.

Removal of Cadmium and lead from aqueous solution by Hydroxyapatite/ Chitosan hybrid fibrous sorbent

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Hydroxyapatite (HAp)/chitosan composites were prepared by a coprecipitation method, dropping a mixture of chitosan solution and phosphoric acid solution into a calcium hydroxide solution. Using the HAp/chitosan composites prepared, HAp/chitosan hybrid fibers with various HAp contents were prepared by a wet spinning method. X-ray diffraction and scanning electron microscopy analyses revealed that HAp particles were coated onto the surface of the fiber, and the surface roughness increased with increasing the HAp contents in the fiber. In order to evaluate the heavy metal removal characteristics of the HAp/chitosan hybrid fiber, adsorption tests were conducted and the results were compared with those of bare chitosan fibers. The results showed better performance in heavy metal ion removal for the HAp/chitosan hybrid fiber than the chitosan fiber. As the HAp content in the hybrid fiber increased, the removal efficiency of heavy metal ions also increased due to the increase of the specific surface area of the HAp/chitosan hybrid fiber. Adsorption kinetic and isotherm tests revealed that Pb^{2+} and Cd^{2+} adsorption to the hybrid fiber follows pseudo-second-order kinetic and Langmuir-type adsorption, respectively.

Synthesis and characterization of polystyrene waste-based activated carbon

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Even if the human race is swiftly moving towards progress in science and technology, but still slowly waking up to the issue of plastic accumulation in the environment. Even though numerous steps are taken to have a solution to the problem, we are still far from reaching a long-term solution. Expanded polystyrene (EPS), a hydrocarbon-based plastic product, comes under the category of non-biodegradable waste materials. Though EPS is used in many industries and always has been in continuous demand. But still, its removal from the environment leads to the release of hazardous polyaromatic hydrocarbons. Scientists worldwide are working on different approaches to using plastic waste for numerous applications; one such use is in energy storage applications. In this study, the focus has been laid out on using the EPS, which has been reported as a rich precursor for synthesizing carbon material for applications in electrochemical energy storage devices. This work used template methods to convert EPS waste into carbonaceous material, followed by chemical activation to obtain a high specific surface area which was comprehended by using BET. The prepared EPS-derived carbonaceous materials showed a large specific surface area and porous structure, which eventually can be used as electrode material in supercapacitors applications. Recycling this waste into valuable materials will sooner or later pave new approaches to dealing with waste in the future.

Plasma assists Titanium Nitride and surface modified Titanium Nitride nanoparticles from Titanium scraps for magnetic properties and supercapacitor applications

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Plasma methods are efficient processing for metal recovery from metal scrap, bearing minerals, electronic waste, etc. In this work, pure titanium nitride nanoparticles (TiN NPs) were synthesized from titanium scraps by the thermal plasma arc discharge (TPAD) method. TPAD synthesized TiN NPs have a highly crystalline nature with cubic and spherical morphologies with average particle sizes of 30 to 100 nm. Further, prepared TiN NPs involving surface modification (SM) or etching processes were investigated by using the non-thermal DC glow discharge plasma technique with air atmosphere at different processing times. SM@TiN NPs have a comparatively low crystalline, which was confirmed from the powder X-ray diffraction technique. SM@TiN NPs have very interesting core shell morphologies, which are due to the surface interactions of ionized air molecules. TiN and SM@TiN NPs have room-temperature ferromagnetic properties with high saturation magnetization (Ms) up to 2.6 and 3.0 emu/g and very high coercivity (Hc) of 235.5 Oe, respectively. TiN and SM@TiN NPs have superior energy storage performance with an outstanding specific capacitance of 192.8 and 435.1 F/g at a current density of 2 A/g with pseudocapacitive behavior. These results reveal that TiN and SM@TiN NPs have highly promising electrodes for supercapacitor applications.

Visualization of wave energy density hotspots from satellite images using Fuzzy C-means

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Wave energy is the transport and capture of energy by ocean surface waves. The energy captured is then used for all different kinds of useful work, including electricity generation, water desalination, and pumping of water. Wave energy is a type of renewable energy and is the largest estimated global resource form of ocean energy. Synthetic-aperture radar (SAR) is a form of radar that is used to create two-dimensional images or three-dimensional reconstruction of objects. SAR imagery provides information about what's on the ground, but distortions and speckle make these images very different from optical images. Wave energy has been studied and explored because of its high potential to supply electricity for day-today activities. Identifying the wave energy density hotspots gives us an advantage of producing more energy with minimum number of wave energy harvesting plants. However, the uncertainty of its spatial and temporal variations increases the difficulty of harvesting wave energy for economic and industrial uses. There are no large-scale wave converters in commercial operation yet. A thorough understanding of wave energy dynamic behaviours will definitely contribute to the acceleration of wave energy harvesting. In this project, SAR images of wave data in India Exclusive Economic Zone (EEZ) will be taken and processed to reveal the wave power density hotspot distribution pattern, and its correlation with ocean surface water temperatures and salinities.

Mechanical behavior of h-BN reinforced PE based nanocomposites with modified interface

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Nanocomposites are emerging as a new class of advanced material for many practical applications. Researchers are trying to enhance the properties of polymer-based nanocomposite by tailoring the interface. Studies related to the static and dynamic behavior of nanocomposites are still in an immature state. Due to superior mechanical and thermal properties, hexagonal boron nitride (h-BN) based nanofillers are emerging as exceptional reinforcing agents for high-density polyethylene. Atomistic simulations were used to predict the reinforcing capabilities of defective h-BN nanosheets for polyethylene against shock compressive loading. It was revealed from the atomistic simulations that the geometrical defects in h-BN nanosheets help in improving the interface strength that further leads to enhance the resistance against shock loading of PE nanocomposites. On the other hand, experimental techniques were used to investigate the mechanical behavior of h-BN/PE nanocomposites using the non-functionalized and functionalized interface. The non-bonded interface weakens the interaction and overall load transfer capability and thus restricts the full potential utilization of nanofiller strength. It was captured from the experiments that covalently functionalized interface helps in improving the tensile strength and high strain rate behavior of PE nanocomposites.

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Relationship between the evolved hydration heat and mechanical performance of the binary blended cementitious mixes containing jarosite

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The current paper explains jarosite's effect on the hydration process of binary blended cement mortar mixes for part replacement of cement. Isothermal calorimetry and strength tests were performed to investigate the hydration heat evolution of the blended cement mixes and the mechanical performance of the mortar, respectively. For describing heat evolution curves in the current investigation, eight variables (heat indexes) H_t, H_1, H_2, H_3, H_4, H_5, H_6 and H_{max} were considered based on heat generated during different periods and the maximum rate of heat evolution. In the study, it is found that the time for the jarosite blended cement mixes to reach sulfate depiction peak increases with increasing doses of jarosite. With the rise in jarosite doses to the cement, the reactivity of the aluminate increases, whereas the chief strength imparting silicate hydration gets retarded. At higher jarosite replacement levels, the mixtures become unbalanced, typically resulting in unwanted major changes in the set times, strength growth, and may also result in too late stiffening because of not adequately controlled aluminate hydration. The results explain that 72 hours of cumulative heat evolution has increased by partial cement replacement with jarosite. The results confirm the influence of jarosite on the hydration reactions.

Awareness, perception, and practices towards blood donation among undergraduate health science students of India during COVID times

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Purpose: This study was done to assess the awareness, perception and practices of health science students towards blood donation during the pandemic.

Methods: This cross-sectional study was done among undergraduate medical, dental, physiotherapy and audiology, speech & learning pathology students in May 2021. A self-administered questionnaire designed using Google Doc was used for data collection.

Results: Out of the 461 participants, only 171(37.1%) knew that Coronavirus was not transmitted through blood transfusion. Only 125(27.1%) participants knew that a minimum of 14 days is required before a donor who tested positive for COVID-19 can donate blood. As many as 339(73.5%) participants expressed their willingness to donate blood in the future. Having donated blood in the past (p=0.001), having vaccinated with COVID-19 vaccines (p=0.029), having taken the complete number of vaccine doses (p=0.0499), and absence of anaemia (p=0.0159) were associated with willingness to donate blood among the participants. Only 83(18%) participants had donated blood after the onset of the pandemic. Out of the rest 378, 106(28%) participants did not donate blood due to the fear of getting infected with Coronavirus. Absence of chronic co-morbidities (p=0.0288) was associated with the history of having donated blood after the onset of COVID-19 pandemic among the participants.

Conclusion: Awareness of participants related to certain key issues related to blood donation and COVID-19 were found lacking. Counselling services to alleviate fears associated with blood donation and awareness sessions to remove misconceptions are required among students to improve blood donation practices.

Manufacturing process and development of geopolymer block using greener material

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Bricks and blocks are crucial building materials in both residential and commercial projects. However, the block is one of the most adaptable modern materials due to its durability through time, production techniques, and use of a variety of constituent elements. Wide spread research is currently being done to create ash-based blocks that are more sturdy and long-lasting using various greener materials. Geopolymerization, an intriguing technique and fascinating technology utilizes greener alumino silicate-rich precursors to form complex harden compounds with appropriate alkali-activators. The idea is to develop a geopolymer greener building block that performs structurally safe and satisfies the desired requirements. The manufacturing process of the greener geopolymer blocks (GGB) is studied and detailed. The greener ash-based geopolymer blocks are tested and the strength, durability features of the blocks is explored vividly.

Developing real-time training dataset for human racial classification

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In every image processing venture the quality of data sample collected and the processing techniques poses direct impact on the result. This work explains development of these vital phases in the context to exploit it for racial classification. Here we propose a novel Indian regional face database (IRFD) consisting of large set distinctive face images of north, east, west, and south regions of India to mitigate the scarcity of regional and labelled face images for future supervised classification process. The face images are collected from different universities and acquired through both online and offline mode. Due to this discrepancy the face database is exposed to challenges like varying dimension size, non-uniform background, low resolution, illumination, and pose variation. In view of addressing these problems we have proposed competent image processing techniques to enhance the quality of images. Varying size and low resolution were the main issues among others encountered while training Convolutional Neural Network (CNN) model. To handle this, we have developed an expeditious compression algorithm which would reduce large size of all images to ±97% less in size without compromising the quality. Further to enhance low quality images we have proposed brightness and contrast adjusting algorithm. The efficiency of this quantitative and qualitative data set is evaluated against CNN model which has yielded ±88.21% accuracy under racial classification.

Quasi two dimensional $CeVO_4$ nanozyme: Fabricated through non-oxidic material

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In recent years, the synthesis of materials in lower dimensions like two-dimensional (2D) or quasi-2D with distinctive characteristics has attracted substantial scientific attention. The mixed transition metal oxides (MTMOs) nanomaterials are the promising group of materials which have been extensively utilized for various potential applications. The most of the MTMOs explored as three-dimensional (3D) nanospheres, nanoparticles, and one-dimensional (1D) nanorods, nanotubes. However, these materials are not well explored in 2D morphology because of the difficulties in removing tightly woven thin oxide layers or exfoliations of two-dimensional oxide layers hindering the exfoliation of beneficial features of MTMO. Here, we demonstrated the fabrication of $CeVO_4$ nanosheets (NS) from non-oxidizing materials using a simple two-step synthesis process. The as-synthesized $CeVO_4$ NS exhibit adequate stability and activity in a harsh reaction environment, which gives excellent peroxidase-mimicking activity with a KM value of 0.04 mM, noticeably better than natural peroxidase and previously reported $CeVO_4$ nanoparticles. We have also used this enzyme mimic activity for the efficient detection of biomolecules like glutathione with a LOD of 53 nM.

Leaf litter decomposition and nutrient release dynamics of flemingia semialata roxb. - A potential woody perennial species for mountain agroforestry

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Leaf litter decomposition and nutrient release dynamics of *Flemingia semialata* Roxb. were studied from May 2016 to April 2017 using the litter bag technique. The study on litter dynamics is needed to assess the nutrient release pattern before introduction in degraded or marginal lands or agroforestry systems for soil nutrient management practices in hilly northeast states of India. The initial N concentration, lignin content, and lignin/N ratio of leaf litter had significant positive correlations with decay coefficients. The annual decay rate constant (k) for dry matter was 0.01 day−1 (3.65 year−1) with t_{50} and t_{99} values of 96.43 and 695.73 days, respectively, indicating faster leaf litter decomposition. Initial C (51%), N (2.38%), and low lignin concentrations with low C/N (21.53) and lignin/N (4.05) ratios could be important factors in faster mass loss from the litter samples. The P mineralization k_P (2.19) rate was higher than k_N (0.73), indicating the slower release rate of N. The weight loss during decomposition was positively correlated with rainfall (r = 0.42) and temperature (r = 0.39). The study suggests that F. semialata leaf litter could be useful for regulating soil nutrient pool through faster litter turnover and can therefore be exploited as plantation and/or agroforestry species for soil and water conservation in degraded sloppy terrain of the region.

A Novel imidazole bound Schiff base as highly selective "Turn-on" fluorescence sensor for Zn^{2+} and colorimetric kit for Co^{2+}

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In recent years, fluorescent molecular sensors for the detection of various metal ions have been an extensive area of research due to several advantages over other techniques. A large portion of the metal ions assumes a significant role in an assortment of industrial tasks like food, drug, paper, material, water treatment, assembling of batteries, and electronic field. In particular, Schiff bases have an excellent coordination environment, which makes them more convenient to be used as a fluorescent probe for the detection of metal ions. Schiff base subsidiaries containing nitrogen-oxygen-rich coordination as a receptor site pave an effective medium for fluorescent detection with observable color change. An imidazole based Schiff base (2-[(1H-imidazole-2-ylmethylene)-amino]-4-methyl-phenol) (IMP), with an imine unit, has been designed and characterized by various standard methods. The evaluation of the probe as a fluorogenic sensor for Zn^{2+} and a chromogenic sensor for Co^{2+} has been rationalized in terms of the PET mechanism. In the presence of Zn^{2+}, a light yellow colored solution of IMP with maximum absorption of 364 nm becomes bright yellow with maximum absorption of 410 nm and a measurable fluorescent signal at 612 nm with bathochromic enhancement. The sensitivity of the fluorescent based assay (6.78×10^{-9} M) for Zn^{2+} is far below the limit in the World Health Organization (WHO) guidelines for drinking water (7.6×10^{-5} M) and therefore it is capable of being a practical system for the monitoring of Zn^{2+} concentrations in aqueous samples. Moreover, IMP showed a highly selective colorimetric response to Co^{2+} by displaying an obvious pink color upon the addition of metal solution immediately without any interference from other ions. These results provide a new approach for selectively recognizing the two most important trace elements in the human body simultaneously, for Zn^{2+} by emission spectra and Co^{2+} by the naked eye.

Reactive oxygen species (ROS) as benign and toxic agent- A juxtaposed attribute

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Reactive Oxygen Species (ROS) are identified as the byproduct of in-vivo aerobic metabolism and in-vitro electronic interaction with atmosphere for nanomaterial .The *in-vivo* ROS within its equilibrium level influenced the intracellular signalling in living body. The in-vitro production of ROS depends on the electronic configuration of the material of interest. The ROS family includes radical natured superoxide anion (O^2.-) , hydroxyl radical (·OH) and the non radical type ROS like hydrogen peroxide (H_2O_2). These ROS majorly contribute themselves in defining catalytic activity, dye degradation and its eradication, cancer therapy, antimicrobial activity due to imposition of oxidative stress. On the contrary the intracellular ROS in abundance may cause cell death due to alteration in cellular redox signalling. The affluence in ROS is attributed to extracellular ROS injection by nanomaterials. These two contradictory aspects of ROS may redefine its benign and toxic attribute. In the present review the juxtaposed attributes of ROS are highlighted. Presently *in-vitro* ROS generation is abundantly focused in nanomaterials which are worthy to yield ROS due to the surface engineered electronic interaction with aerial oxygen and water. The surface engineered ROS generation is modulated by a string of parameters including stimulator (photonic) energy, morphology, band gap etc. This present review highlights the benign approach of this in-vitro ROS in eradication of harmful dye in regards of environmental pollution, antimicrobial activity in regards of nanomedicine, implant device etc., cancer treatment in terms of photodynamic therapy. On the contrary the toxic effect is explored in terms of ROS induced inflammation, cardiovascular, neurodegenerative diseases etc. This review will definitely be a harbinger of utilization of ROS in order to have well being.

Mixed lead, tin and germanium hybrid halide perovskites for photovoltaic applications

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Amongst the third generation solar cells materials, Hybrid halide perovskite (HHP) materials present the most promising properties. Methyl ammonia lead iodide, i.e., $CH_3NH_3PbI_3$ ($MAPbI_3$), dominated the research field owing to its excellent photovoltaic properties, but the presence of toxic Pb forbids its commercial deployment on large scale. Mixed cation and anion strategies can play a significant role in improving structural stability and reducing toxicity. Partial or full replacement of Pb with congener but non-toxic elements such as Sn and Ge can facilitate the large uptake of HHP solar cells. In this work by first-principles calculations, we explore the potential alternatives to $MAPbI_3$ by investigating the structural, electronic and optical properties of $MAPb_{1-x-y}Sn_xGe_yI_3$ [(x, y) = (0, 0.5), (0.25, 0.25) (0.5, 0)] using Density Functional Theory (DFT) formulations. The present report indicates that via Ge and Sn-doping in $MAPbI_3$, the bandgap can be tuned from 1.16 eV to 0.77 eV. Meanwhile, in the Sn/Ge/Sn–Ge doped $MAPbI_3$, the optical absorption coefficients get enhanced in the visible region and in the regions as far as mid-infrared, making them better alternatives to toxic $MAPbI_3$ for photovoltaic applications. Moreover, due to the excellent photovoltaic characteristics, $MAPb_{0.50}Sn_{0.25}Ge_{0.25}I_3$ is proposed as an absorber layer material for the efficient perovskite solar cell modules.

Clay-polymer nanocomposites for wastewater treatment

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A majority of water pollution or contamination occurs through the discharge of effluents from industries. Wastewater treatment is crucial to protect our water sources from harmful pollutants. Therefore, a number of efforts have been made to tackle this issue by employing different techniques. Clay minerals and polymers are among these materials used extensively in wastewater treatment. While both have their own drawbacks, it is fascinating to discover that they complement each other to overcome most of their limitations. As a result, clay-polymer nanocomposites (CPNs) have been found to be highly efficient in the adsorption of pollutants from water and show promising results to be a long-term candidate for this purpose. In my talk different types of clay and polymers used in the preparation of CPNs, factors affecting their performance shall be discussed. Various studies indicate that CPNs are only a few steps away from becoming one of the best options for wastewater treatment due to their multiple desirable properties.

Performance investigation in perovskite based solar cell

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Usually, the conventional solar photovoltaic cell is made up of silicon. It took over four decades for silicon to reach 15-17% efficiency when used commercially and a life span of 25 years. On the other hand, it took only one decade for perovskite to reach 21% efficiency and 1 to 2 years of lifespan.This study focuses on establishing that performance of solar cells can be improved by using perovskite solar cells. In this study, an attempt has been made to establish that solar cells made up of perovskite material are more beneficial and overall efficient as compared to traditionally used Silicon Solar Cells. Furthermore, the halfcut and quarter-cut topologies will be applied to increase solar cell efficiency during shading condition. In order to simulate the perovskite-based PV module and to implement the topologies on the solar cells, the parameters like short circuit current, open-circuit voltage, quality factor, series resistance, forbidden energy gap, and irradiance are calculated for both silicon and perovskite solar cells. After knowing these parameters, the silicon and perovskite solar cell model with half-cutand quarter-cut topology is simulatedon MATLAB/Simulink,results shows the efficiency of perovskite is 20.65 % and that of silicon solar cell are 16.37%. When the half-cut and quarter-cut topology is implemented on the perovskite solar module, the half-cut cells efficiency changes from (13.6%from 12.5%) when the shaded area increases from (676cm^2 to 2028 cm^2), and the perovskite solar module efficiency with quarter-cut solar cells changes from (16.05%from 15.8%) when shaded area increases from (676cm^2 to 2028 cm^2).

Simulation modelling techniques for managing epidemic outbreak: A review, classification schemes, and meta-analysis

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The purpose of this paper is to enhance the knowledge base for simulation modelling techniques that have been used extensively in the literature to tackle the epidemic outbreak. In this paper, 79 articles are identified and reviewed between 2005 and 2020 to understand many problems related to the spread of the disease, scarce resource management, and the influence of mitigation strategies to contain the epidemic outbreak. The objective is to recognise the importance of simulation modelling techniques to effectively handle these problems and discuss how and when a particular technique can be used to provide satisfactory solutions for difficulties posed by an epidemic outbreak. This paper presents a literature review, classification schemes, and a simple meta-analysis to help decision-makers make informed decisions to curtail the epidemic outbreak.

MEMS based metal oxide semiconductor carbon-di-oxide sensor for pollution monitoring

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This paper describes the design and development of low power Micro Electro Mechanical Systems (MEMS) microheater and metal oxide semiconductor CO_2 sensor. To achieve low power, suspended plasma enhanced chemical vapor deposited SiO_2 diaphragm is used. $BaTiO_3$-CuO is considered as metal oxide doped with 1% Ag and will be used as a sensing material to sense the CO_2 gas. To get the required temperature for the sensing film, three different metals namely, Platinum (Pt), Titanium (Ti) and Tungsten (W) are simulated by using COMSOL Multiphysics 5.6. The proposed microheater structure is shown to have a good temperature consistency throughout the heater's active region while consuming low power. The microheater geometry of 100 μm × 100 μm with its electro-thermal temperature results is presented here. For an applied voltage, we report a maximum average temperature of Pt i.e. ~99.51%, Ti ~ 97.12% and W ~ 89.78% for 300°C respectively. Fabrication of CO_2 sensor along with MEMS microheater had been designed and demonstrated. Energy consumed by the proposed platinum microheater geometry is 4.8 mW at 250°C and 5.8 mW at 300°C. The sensitivity characteristic is based on resistance sensing which has been found to be 21% for 400 ppm CO_2 gas concentration and 70% for 1000 ppm. Comparatively capacitive based sensitivity is found to be ~54% for 400 ppm and 95% for 1000 ppm.

Through silicon via’s compact modeling for the thermal analysis in three dimensional integrated structures

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BMS College of Engineering, India

To realize 3-D ICs (Three-Dimensional Integrated Circuits), heat mitigation is a significant difficulty. It is crucial to investigate the TSV's (Through Silicon Via) analytical thermal behaviour. In the literature review, other models that were more complex and larger were determined to be insufficient to address this issue. Resistance networks are utilized in this research to provide more straightforward and compact models for the TSVs' heat transmission in both the vertical and horizontal directions. These models' accuracy is contrasted with that of models generated by commercially available CFD (computational fluid dynamics) tools. Multiplication factors are used to correct the tool's and developed models' correction errors, obtaining an accuracy of 4.18%. Considering heat transfer and physical behaviour of three planar TSV stacked systems, different thicknesses of a liner, filler, soldering, and substrate materials are explored. The main goal is to include thermal resistance networks that are more accurately captured in heat dissipation pathways, both vertically and horizontally. The 3-D IC structures' face-to-face fabrication stacked approaches or active interposer simulations can both use the proposed models of TSVs.

An electrochemical approach for the quantification of the interaction parameters of mercaptopropionic acid (MPA) capped CdSe QDs and Chitosan for the fabrication of biocompatible theranostic nanoprobe

Jagriti Gupta, Kishan Das, Ayushi Tanwar, Jaydeep Bhattacharya and **Paulraj Rajmani**
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Quantum Dots (QDs) with unique properties have been used in applications such as drug delivery, biosensing, bioimaging, etc. Still, Cd-based QDs have some limitations due to nano-based toxicity. Biopolymer coating or encapsulation of QDs in biopolymers is exciting in designing more biocompatible nanoprobes with biological significance. However, the strength and stability of the biopolymeric layer that provides surface protection for the QDs by making a stable interface between QDs and biological entities depend on the binding parameters of the biopolymer and QDs. This work focused on employing cyclic voltammetry (CV) to study the interaction of the most abundant biocompatible biopolymer chitosan with water-soluble MPA-CdSe QDs synthesized by hot injection. The binding parameters, such as the number of binding sites and the binding constant, were calculated by cyclic voltammogram. Physical characterization of MPA-CdSe QDs and chitosan-coated MPA-CdSe QDs was done by UV-visible absorption spectroscopy, fluorescence spectroscopy, TEM, dynamic light scattering (DLS), zeta-potential techniques, and FTIR, etc. The comparative cytotoxicity of coated and non-coated ones has been evaluated by cell proliferation assay on an adenocarcinoma human alveolar basal epithelial cell line (A549) and Chinese hamster cell line (V79). Confocal microscopy has also been used to explore the property of chitosan-coated MPA-CdSe QDs as a bioimaging agent.

Manufacturing process and development of geopolymer block using greener material

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Bricks and blocks are crucial building materials in both residential and commercial projects. However, the block is one of the most adaptable modern materials due to its durability through time, production techniques, and use of a variety of constituent elements. Wide spread research is currently being done to create ash-based blocks that are more sturdy and long-lasting using various greener materials. Geopolymerization, an intriguing technique and fascinating technology utilizes greener alumino silicate-rich precursors to form complex harden compounds with appropriate alkali-activators. The idea is to develop a geopolymer greener building block that performs structurally safe and satisfies the desired requirements. The manufacturing process of the greener geopolymer blocks (GGB) is studied and detailed. The greener ash-based geopolymer blocks are tested and the strength, durability features of the blocks is explored vividly.

Topological indices of chemical graphs

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The topological index of a graph is a very important topic for chemical graph theory. Many topological indices are defined based on the distance between the vertices and the degree of the vertices. Also, recently some topological indices have been defined based on the neighbour degree of vertices. In 1947, Wiener first time defined a topological index based on the distance between the vertices known as the Wiener index and it is used to find the boiling point of alkanes. This index can determine only for the hydrogen suppress graphs. Latter in 1975, Randic defined a degree-based index which is known as the Randic index and it is useful for non-hydrogen suppress graphs also. Recently, many other topological indices such as Hosoya index, Hyper-Wiener index, Estrada index, Randic index, Zagreb indices, Szeged index, etc. are also defined with several mathematical properties and applications. These indices are used to investigate several physical, chemical and biological properties of chemical graphs. Recently, some of these topological indices have been defined on fuzzy graphs and very few papers have been published on such graphs.

A research on herbal treatment against ectoparasites in cattle

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In herbal way we can treat cattle bite by ectoparasites parasite, nowadays world is looking towards herbal remedy and it is being brought as medicine and it is proving effective. Ectoparasites are parasites that live on or in the skin but not within the body. Fleas, ticks, lice and ear mites are common ectoparasites. Current control methods of ectoparasites, management controls include removal of dung and manure and provision of proper drainage for fly populations targeting their breeding sites, chemical control, development of resistance to it, public concern in terms of residues in food, Includes biological control. Despite many problems like environmental pollution, life form is used, manipulated and exploited. Sterile insect technology sterile insect technology is a method of biological control by which large numbers of sterile insects are released to suppress populations of others. By using herbal remedies such as (garlic, neem leaves, neem fruits, acorus rhizome, turmeric, lantana leaves, basil leaves) by applying it in the form of cream to the ectoparasites parasite bites of cattle. Diagnosis can be found from ectoparasites disease.

Developments and research on fire response behaviour of prestressed concrete members

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Prestressed concrete is widely used for various types of structural applications, and unexpected fire during its service life can lead to premature tendon rupture. Prestressed tendons in high tensile stress are vulnerable to fracture at elevated temperatures and result in low fire resistance due to spalling of concrete with temperature rise. A good understanding of the failure mechanism and fire response behaviour of prestressed members would lead to the development of prestressed concrete members with enhanced fire resistance. A detailed and elaborate literature survey on the performance of prestressed concrete members under elevated temperature has been undertaken. The fire response behaviour of prestressed concrete members has been extensively studied, and various research studies highlighting the critical temperature and failure mechanism of concrete and prestressing steel are discussed. The factors responsible for bond strength degradation were determined from the literature. The parameters influencing the fire performance of prestressed concrete members are also identified and the parameters such as concrete cover, aggregate type, the volume of polypropylene fibres, and cement blend with a lesser amount of silica fume are found to have a significant effect on improving fire resistance. The fire response of sustainable precast prestressed members with Carbon Fibre Reinforced Polymer (CFRP) tendons was also studied and it has been found that the performance of such members under elevated temperature depends mainly on concrete ingredients and volume of polypropylene fibres used in concrete.

Electrochemical behavior of Ni-Ti (Superelastic) in the artificial saliva in the presence of antibiotic tooth infection sulfa drug-Phexin

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Objectives: Ni-Ti alloy is already a corrosion-resistive material at its most. But when it is used in dentistry as orthodontic wires. It is exposed to severe conditions as it meets the saliva that may carry the chemical composition during the time when patients are continuously exposed to the particular set of tablets. In this part of the study, an antibiotic sulfa drug Phexin was taken to analyze. The possibility of being used by patients while they were fixed with orthodontic wires may bring some impact on the Ni-Ti orthodontic wires. So the study can be made to understand its behavior towards corroding, Ni-Ti alloy.

Scope: Patients are exposed to different drugs, and at the end of the analysis like this, one can conclude it is not dangerous to consume while they have orthodontic wires. The result associated with this part of the study indicates the presence of these drugs resists corrosion activity.

Methods: Used - It is been studied by using electrochemical studies like Potentiodynamic polarisation and Ac impedance spectroscopy. SEM images had shown a clear image of the appearance of the surface area of the alloy. The polarization study had shown a decrease in corrosion current when it is intact with the tablet and a decrease in LPR value had shown good resistance against corrosion with those who even take this tablet.

Results : The study proved, the interaction between the metal surface and tablets, and that in turn provides a way better resistance against corrosion.

Molecular dynamics study of effects of Helium configurations on crack tip performance in Nickel

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Designers are constantly looking for ways and means to ensure safety of nuclear reactors. The challenge of Helium embrittlement in nickel-based alloys are currently unexplored in the nuclear industry. Helium bubbles have a detrimental effect on the mechanical properties of nickel. Despite numerous experimental and theoretical studies, the exact mechanism governing the helium induced embrittlement is not properly explored. In the present work, effect of various configurations of helium on mechanical properties of nickel crystal have been investigated using molecular dynamics simulations. The effect of different orientation of crack plane in conjunction with loading direction in a FCC crystal of Ni was scrutinized along with embedded helium bubble. Deformation was primarily found to happen by stair rod and Shockley type dislocation in two of the orientations, while, Lomer Cottrell locks and twinning are responsible for the deformation in third orientation. Helium bubble deteriorates the strength of single crystal of Ni containing an embedded crack. The results indicate that orientation of the crystal along with modulation of helium clusters is an implicit means to understand various defects in the crystal of Nickel.

Environmental sensing using ZnO layer

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The detection of environmental gases (H_2 CO and NO) in the atmosphere is a topic of interest for public security, environmental pollution and industrial emission. Nowadays, semiconductor based gas sensors has attracted wide attention in the research community. Among various gases, detection of NO at room temperature with fast response and recovery time is still a challenge. In the present work, we have adopted one step synthesis of zinc oxide (ZnO) nanostructures for the fabrication of NO gas sensor. The sensing material was characterized by X-ray diffraction and scanning electron microscopy. We have detected 15 ppm NO gas at room temperature using ZnO nanostructures based chemiresistive sensor. This sensor is found to have ~12% with fast response, complete resistance recovery, and good baseline stability at 50°C. Also, selectivity of these sensors has been investigated for different gases. The sensitivity of this material is explained in terms of interaction of NO molecules with adsorbed oxygen vacancies in ZnO which promote better pathway to the charge carrier.

Role of photonics in 5G use cases towards constructing digital world

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The race for 5G's global market debut has begun, Nokia has recently signed an MoU with BSNL and Airtel to work on 5G technology solutions, and Reliance Jio has tied up with Samsung to explore various technologies and equipment for 5G. 5G's promise of less than 1 ms latency and up to 10 Gbps speed, will transform everyday living. However, a 5G reality will require fibre deployment in the country to increase 2-3 times from the current 16-18 million fibre per km per year. In the wake of growing awareness around Internet of Things (IoT) and the use cases it presents to Indian businesses and consumers, 5G will open a new era of opportunities for telecom operators and ecosystem partners in the country. The growth of 5G will be fuelled by the sharp hike in consumer data and the proliferation of IoT devices. The fact that 5G network will have to support bursty data from emerging applications like Video on Demand (VoD), IoT, Smart Cities, and the like also makes backhaul a critical concern. In several markets, operators are turning to fibre backhaul as an alternative to costly microwave technologies. Since fibre is essential for both wireline and wireless networks, investors show greater levels of confidence in fibre investment. This is an exciting time for India, and the impact of 5G and its associated enablement of M2M, IoT, Autonomous driving and AR/VR can be anticipated. Given the 5G requirement for latency reduction (from 50ms to 1 ms) and speed from 100 Mbps to 10Gbps, the fibre deployment in the country will need to increase from current market of 16-18 million km per year to at least 2-3x per year. 5G will also require a multi-fold increase in small cells deployment, with each small cell having backhaul on fibre.

Invisible to visible: An approach to groundwater crisis and the way to find out its prospect

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Groundwater and the looming crisis are now scientist's top priorities. The groundwater issue is primarily attributable to the excessive pumping of groundwater caused by contemporary agricultural expansion, vast urbanization, significant population increase, and another related groundwater overuses. Groundwater depletion during the last 20 years is the focus of this investigation. A part of Rarh Bengal in Eastern India was used as a case study for the study's general findings, and it was discovered that groundwater levels had been dropping at a pace of 0.8 m per year before the monsoons and 0.9 m per year after them during the last 20 years. This is because to the widespread growing of the rabi crop. The test area comprises various geological features, from hard igneous rock in the west to softer alluvial deposits in the east. The groundwater regime is more rapidly impacted by geological diversity. In addition, it has been predicted that the groundwater level might drop by as much as 25 to 30 meters by 2030. This forecast has been made using a machine learning model trained on artificial neural networks, which raises serious concerns. Our future, then, is in grave peril. This study aims to identify the groundwater prospect zone by employing various statistical and machine learning models, including the Analytical Hierarchical Process, the Weight of Evidence, the J48, and logistic regression. Based on these models, it was determined that the eastern part of the study area possesses more significant potential than the western part due to geological, pedological, and surface hydrological factors. This study's findings are essential for sustainable development because they provide light on the root causes and likely future outcomes of the groundwater issue and pave the road for its resolution via the delineation of groundwater prospect zones.

Characteristic features and therapeutic potential of a L-asparaginase from a marine bacterium

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L-asparaginase is an antileukemic enzyme that is vital in treating patients with acute lymphoblastic leukaemia (ALL) and other blood cancers. Consequently, the exploration of L-asparaginase has been one of the prime contemplations of various groups. However, the clinical trial of L-asparaginase has been observed to elicit several side effects. Additionally, frequent dosages of this form of enzyme is required due to its shorter half-life in blood circulation, leading to lower clinical efficacy and increased treatment cost. Therefore, extensive efforts are made to attain alternative sources of L-asparaginase with improved features. In this study, an extracellular glutaminase-free L-asparaginase-producing Bacillus australimaris NJB19 was selected from marine resources. The derivation of optimum levels of variables for the enzyme production resulted in considerably increased yield of L-asparaginase production. Further, the biochemical analysis of the protein was conducted for finding out optimum parameters, Km and Vmax. The structural analysis suggested that the protein was type II L-asparaginase with no toxin domain. Furthermore, the cytotoxicity of the produced L-asparaginase was evaluated on three solid tumor cell lines employing MTT and LDH assays. The cytotoxicity assay showed the highest cytotoxic activity for MCF-7and to MDA-MB231 and DU-145 cells. Therefore, glutaminase-free L-asparaginase from marine B. *australimaris* NJB19 has a high potential to be exploited commercially for ALL treatment.

Comparative evaluation of the efficacy of light amplification by the stimulated emission of radiation, desensitizing agents, and their combined effect on dentinal hypersensitivity in cuspids and bicuspids – In Vivo Study

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Context: Dentinal Hypersensitivity is the most common dental problem, in order to find a suitable treatment, plan this study was conducted incorporating LASER and desensitizing agents on the patients complaining of dentinal hypersensitivity in cuspids and bicuspids. Most of the desensitizing agents provided incomplete relief hence the combination of LASER and Desensitizing agents proved to be successful.

Aim: The aim of this study is to evaluate and compare the efficacy of individual desensitizing agents and c (LASER) and also to know their potential in reducing dentinal hypersensitivity when both desensitizing agents and LASER are combined together and applied on cuspids and bicuspids.

Setting and Design: Sixty patients with sensitivity only in cuspids and bicuspids and not having caries, restoration, or undergoing any desensitizing therapy were selected. Patients were divided into 5 groups with 12 patients in each group.

Materials and Methods: Air blast stimulus was given for 10 s from 1 cm distance on the affected group. Verbal analog score was recorded. Treatment was carried on according to the groups mentioned: Group

I – nanohydroxyapatite was applied for 15 min; Group II – biosilicate was applied for 15 min; Group III – LASER application was done twice for 60 s in noncontact mode; Group IV – Nanohydroxyapatite plus LASER application; and Group V – biosilicate plus LASER application. Desensitizing agent was applied with the applicator tip and was left for 15 min. It was then rinsed and again the stimulus was given, and the score was recorded. The same treatment procedure was repeated on 1st, 7th, and 14th day and the score was recorded and analyzed using ANOVA.

Results: The maximum reduction in sensitivity score was observed in patients where nanohydroxyapatite and LASER application was done.

Conclusion: All the investigated treatments have promising desensitizing potential, but maximum was found in Group IV > Group V > Group III > Group I > Group II.

Pillared interlayered nanostructured clay materials to improve indoor air quality by selective removal of volatile organic compounds

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Volatile organic compounds (VOCs) from off-gassing of building materials, furnishing, and beauty products, accumulate in indoor environment and worsens the indoor air quality. In the present study, two adsorbents (Cr-PILC & Fe-PILC) were prepared from natural clay via isomorphic substitution of hydrated inorganic oxides of polyoxocations like Cr and Fe metals in montmorillonite clay minerals. The successful synthesis of these materials are investigated through N2- adsorption-desorption isotherm, SEM, XRD, and FTIR. Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) were selected as model indoor VOCs and low pressure adsorption isotherms (1.0 P/P°) were used to estimate the selectivity and phase diagrams for separation of binary mixtures of these VOCs. The significant differences can be observed related to the surface chemistry between the starting and prepared materials. Fe-PILC shows the higher adsorption capacity for BTEX followed by Cr-PILC and starting material which are strongly dependent on surface area, kinetic diameter, and enthalpy of vaporization. In ascertaining the selectivity for separation, structural and chemical properties of VOCs, adsorbent materials and type of binary mixture were found to be the critical parameter. PILCs shows the higher selectivity for the Benzene/Xylene binary mixture followed by Toluene/Xylene and Benzene/Ethylbenzene and the selectivity > 3 shows their industrial application.

Dimensional stability of cryotreated diaphragms of pressure transducers

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Measurement of cryogenic propellant pressures (liquid oxygen and liquid hydrogen) of rockets is very critical for their successful launch. These pressure measurements are carried out using integral diaphragms pressure transducers which are produced by machining precipitation hardened martensite stainless steel (APX4). The transducer has a thin circular diaphragm . One surface of the diaphragm senses the input propellant pressure and on the other side strain gauge is bonded. The diaphragm senses input pressures and gets proportionally deflected at the centre due to the stress induced. This stress is converted to strain and gets transmitted to the strain gauges. This strain is converted into a measurable electric output through wheat stone bridge network. These transducers are expected to exhibit dimensional for the reliable performance throughout their useful life. The precipitated hardened martensite stainless steel used for machining pressure transducer does not contain hundred percent martensite and possesses certain amount of austenite (around 3-4 %) known as retained austenite. Martensite has strong and hard microstructure as compared with austenite which is soft, tough and ductile. This unstable retained austenite slowly gets converted to freshly formed martensite with time which has different coefficient of volumetric expansion. Differential volumetric expansions within the metal cause dimensional changes and produce dimensional instability to causing zero shift and drift in output readings. The conversion from retained austenite to martensite is faster in the presence of high residual stress. Cryotreatment is a proven technique to reduce such residual stresses. Hence, the machined diaphragms were subjected to cryotreatment using liquid nitrogen. Dimensional stability analysis of both regular and cryotreated diaphragms were carried out using Thermo Mechanical Analyser (TMA). Results indicated significant enhancement of dimensional stability of diaphragms which were subjected to cryotreatment.

Import intensity of India's manufactured exports – An industry level analysis

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India opened up her domestic market to global competition in early 1990s, however, it was in the early 2000s that the trade dynamics gained momentum with India actively entering into free trade agreements, both regionally and bilaterally. The period between 2000-01 and 2017-18 witnessed a surge in imports from $50 billion to $384 billion, respectively. One of the fallouts of import liberalisation policy was internationalisation of the production process. Import intensity of exports based on input-output tables for various years till 2013-14 reveals that rise in imported inputs in the export sector did not have a positive impact on exports. Secondly, the impact of these imported inputs led to a rise in the demand for skilled labour than the abundant less skilled labour that India possesses. In future trade negotiations, the heterogeneity of Indian industry should be an important consideration while negotiating trade deals to enable greater imports of intermediate inputs necessary to boost the productivity of exporting firms.

Mechanical and microstructural characterization of friction stir welded AA6061-T6 joints reinforced with nano-sized particles

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This study investigates the effect of reinforcement strategy on nanoparticles distribution in terms of mechanical and metallurgical properties of FSW welds. Also, the size and dispersion of reinforcement particles in various zones of the FSW process were analyzed using optical microscopy (OM), scanning electron microscopy (SEM), and transmission electron microscopy (TEM). The micro-hardness of unreinforced and reinforced samples was evaluated with more emphasis on the processed zone (nugget zone) which is further correlated with grain size and particle morphology. The findings revealed that refinement of grain size is more significant in the nugget zone of FSW- Al_2O_3 sample compared to FSW-TiO_2 sample which is attributed to Zener-effect occurred via small-sized nanoparticles that helps to restrict the growth of grains accompanied by dynamic recrystallization throughout FSW process. The micro-hardness in the processed zone was increased due to increase in uniform Al_2O_3 nanoparticles distribution with peak micro-hardness of 89 ± 3HV in comparison with the parent metal, whereas surface defects occurred because of decrease in TiO_2 nanoparticles distribution leads to increase in grain size that results in a decrease in material strength with average micro-hardness of 78 ± 5HV. The mechanical results revealed that due to high density of uniform Al_2O_3 nanoparticles distribution in the nugget zone it results in an increase in tensile strength, yield strength and wear resistance with appreciable increment in ductility, whereas, TiO_2 nanoparticles presence results in a decrease in tensile properties due to nanoparticles cluster formation which leads to decrease in ductility and wear resistance and increment in frictional coefficient.

Synthesis and characterization of Ce doped CdO nanoparticles by chemical precipitation method

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The cerium doped CdO Nanoparticles were synthesized by chemical precipitation method with three level of cerium (1%, 2% and 3%). Powder X–ray diffraction pattern indicate the formation of cadmium oxide nanoparticles with cubic structure and average particles size were measured to be ~20 nm. The relatively stronger intensity peaks at 32.963 after Ce doped have been shifted to 30.436, 30.430 and 30.480. This shift is due to the difference in the ionic radii Cd^{2+}=0.95Å, Ce^{3+} = 1.03Å. The presences of various functional groups related to metal oxide and organic molecular groups were find out from the FT–IR spectroscopy. Were the structural deformations of CdO Nanoparticles, due to the replacement of either substitutional or interstitial cadmium ions in the CdO lattice by Ce ions. Such Ce ions would introduce some additional energy level in the CdO band gap close to the valence band edge. The surface morphological and elemental compositions were evaluated by Scanning electron microscopy (SEM) and Energy dispersive X–ray spectroscopy (EDS). Finally, the crystallinity of Ce doped CdO NPs were confirmed through TEM and SAED patterns.

Adiabatic circiuts for SoC

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Adiabatic CMOS circuits have been proposed as a low power option for CMOS SoCs, but have not gained popularity due to practical difficulties in scaling to millions of gates. The architecture of a pipeline of stages with slow transitioning clock phases demands the generation and distribution of clock phases precisely and efficiently. This power needs to be more than offset by the power savings from the use of adiabatic circuits. This presentation presents some key issues with adiabatic circuit styles, and chooses to solve the problem with a circuit style for use in SoC. Three published topologies, namely Positive Feedback.

Adiabatic Logic (PFAL), 2 level Adiabatic Logic (2-LAL) and Clocked Adiabatic Logic (CAL) are considered in 40nm CMOS technology at 100MHz. Details to motivate efficient solutions are presented.

Experimental Investigation and regression modelling of resistance spot welded joints of dissimilar steel sheet by using surface response methodology

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Assessing the strength performance of spot-welded joints of dissimilar material is critical for their continued integration into the automobile and aerospace industries. The effect of weld joint strength is an important consideration in the design of weld structures. The objective of the present work undertaken to investigate the effect of the input process parameters on the strength of the welded joint of dissimilar material. Full factorial design (FFD) has used for designing the experiment matrix. Further, experimental results have used to develop a mathematical model to predict the strength of the spot weld joint. Analysis of Variance (ANOVA) has been applied to create the correlation between the process parameters and their interaction on the output. The confirmation test case experiments have conducted for validating the developed mathematical model and observed that the developed model is capable of evaluating weld joint strength within the process parameters.

New class of lightweight steels with improved mechanical characteristics

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Due to its superior mechanical qualities and corrosion resistance, steel has played a significant role in practically every aspect of human civilization, from kitchenware to home appliances, food processing, transportation, and the motor industry. Due to the high density and weight, steels are not suitable for use in vehicle and aviation engineering, steel is a heavier material overall and has undergone extensive research and development to lighten it. These lightweight steels are strong and malleable, making them ideal for making automotive components. A lightweight stainless steel (LWSS) with ultra-high strength of greater than 1GPa and high ductility of greater than 35% has reportedly been developed, according to some investigators. These alloys range in composition from 20 to 30 for Fe, 11.5% to 20.0% for Mn, and 1.45% to 1.5% for C.

Many researchers have replaced magnesium with chromium to increase the higher strength to weight ratio as well as the ductility which is an essential property of structural steel. Some researchers have also replaced magnesium with nickel with the same aim.

However, these kinds of steels could not be commercially viable due to the scarcity and greater cost of nickel and chromium, as well as the likelihood of environmental risks and health problems.

The goal of the current work is to fabricate a new class of lightweight steels which are sustainable, less hazardous, and cheap by varying the manganese and chromium concentration as well as adding varying amounts of silicon. The fabrication of the samples is to be done through simple powder metallurgy method. Mechanical properties, optical microstructures, precipitation of k-carbides, atomic contents of alloying elements of the fabricated steels are to be studied.

Back-bias effect on the ambipolar current in SOI tunnel FETs

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A two-dimensional (2-D) technology computer-aided design (TCAD)-based simulation study of the back bias in the ultrathin silicon-on-insulator (SOI) tunnel field-effect transistor (TFET) is presented. The transfer characteristics of a conventional TFET called the back-bias TFET (BB-TFET) depend on the back bias and the oxide thickness below the TFET epitaxial layer. The back bias affects the electric field at the source/channel and drain/channel junctions, hence both the ON-state current (ION) and the ambipolar current (IAMB) reduce with a negative back-bias voltage. This reduction in ION is not desirable in a TFET, hence a modified TFET structure called the back-bias underdrain TFET (BBUD-TFET) is proposed. In the BBUD-TFET, the back bias is applied on a p-Si pocket placed under the drain region, which is isolated using an ultrathin oxide. The back bias in the proposed BBUD-TFET mainly affects the electric field at the drain/channel interface, having a negligible impact on the source/channel interface. The BBUD-TFET structure is analyzed with SiO_2 or HfO_2 as the gate oxide. In the BBUD-TFET with HfO_2 as the gate oxide, the back bias completely suppresses the ambipolar current without reducing ION. Furthermore, the oxide thickness and back-bias voltage are optimized for the BBUD-TFET structure. In this study, 2-D TCAD simulations are carried out to investigate and analyze the performance of the BB-TFET and BBUD-TFET.

Influence of stabilizer on mechanical and micro characterization of treated aggregate base course

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The increasing growth of the heavy vehicle with multi-axle and increased tier pressure needs higher thickness pavement to withstand the load. The thickness can be reduced by strengthening the layers by employing stabilization. Cement is a stabilizing agent due to its availability but is associated with problems like shrinkage cracking and CO_2 emission during its manufacturing. Several industrial byproducts are available that can also be used as cement alternatives. So the present study investigates the effect of lime-fly ash (LFA) and grounds granulated blast furnace slag (GGBS)-Cement (GC) on the properties of base stabilization based on micro characterization and laboratory testing such as compaction, unconfined compressive strength(UCS), indirect tensile strength (ITS), durability test, indirect tensile resilient modulus and fatigue test for different curing period. Optimum moisture content (OMC) and maximum dry density (MDD) were determined using a modified proctor test. Cylindrical specimens were prepared from natural aggregate stabilized with 10% & 15% of LFA, 6% & 8% of GC and 5% and 7% cement. Test results showed that the GC blend gives the highest UCS and ITS. The strength was increased with an increase in the binder content and curing period. The stiffness was increased with an increase in the LFA percentage from 10% to 15%, but the fatigue life was decreased. The microstructure results show more hydration products in GC blends than cement and LFA. The material cost of the LFA-stabilized layer is 27% less than that of cement-stabilized layers.

Natural language processing applications

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The rapid growth of Internet-based applications, such as social media platforms and blogs, has resulted in comments and reviews concerning day-to-day activities. Sentiment analysis is the process of gathering and analyzing people's opinions, thoughts, and impressions regarding various topics, products, subjects, and services. People's opinions can be beneficial to corporations, governments, and individuals for collecting information and making decisions based on opinion. This data can then be analyzed for various use cases, one of them being an evaluation of standards and analysis of new updates in the medical field. Domain experts are researching actively to find more uses of sentiment analysis and other NLP applications. This application helps healthcare service providers collect and evaluate patient moods, epidemics, adverse drug reactions, and diseases to improve healthcare services. In conclusion, applying sentiment analysis to analyze patient-generated data on social media can help determine patients' needs and views.

Testing the Anti-aging effects of extract of Nigella sativa and its bioactive compound Thymoquinone using NLCs as drug delivery systems

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Aging is a natural physiological change that takes place in living things throughout time. The end result is that it leads to natural death as one ages along with gradual dysfunctions of all organs in the organisms. Nanotechnology is heavily used in drug delivery technology for passive and active targeting via various routes of administration.The overarching goal of nanotechnology is to diagnose as precisely and quickly as possible, and to treat as effectively and painlessly as possible. NLCs (nanostructured lipid carriers) are novel pharmaceutical formulations made up of physiological and biocompatible lipids, surfactants, and co-surfactants. NLC has emerged as a second generation lipid nanocarrier and a viable alternative to first generation nanoparticles over time. In this study, we tested cytotoxic effects of Nigella sativa extract and Thymoquinone (TQ) on HaCaT cell line over the course of 24 and 48 hours using NLCs as drug delivery system. IC50 values of the formulations were calculated and found to be 1.989991 mg/ml and 0.74612 uM at 24 hours, and 0.54040 mg/ml and 0.63559 uM at 48 hours. Physicochemical tests were also performed and the results were recorded. For TQ NLC, a zeta potential of -7.74 mV and a diameter of 109.9 nm was recorded.

A simple and efficient algorithm for material transportation under uncertain environments

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This talk will discuss the optimal transportation of materials in fuzzy and intuitionistic fuzzy environments. We frequently face uncertainty and hesitation in real-life decisions due to uncontrollable factors. For example, in the case of transportation issues, the availability of umbrellas is not known precisely due to long power outages, overtime labor, unexpected machine failures, and so on. The demand of an umbrella is not known exactly due to seasonal changes (on rainy days, the sale of an umbrella is higher than on sunny days). The transportation cost is not known exactly due to variations in gasoline rates, traffic jams, the weather in hilly areas, and so on. So to counter this issue, we consider the concept of optimization problems (the transportation problem is an optimization problem with a linear objective function and linear constraints) in fuzzy and intuitionistic fuzzy environments. The importance of considering the concept of optimization problems in fuzzy and intuitionistic fuzzy environments will be presented. A computationally simple and efficient method called the PSK method for solving intuitionistic fuzzy optimization problems will be presented. Additionally, theorems will be explained to substantiate the optimality of the solutions. Some new and important results will be introduced. Lingo/Matlab programming code for solving intuitionistic fuzzy transportation problems will be introduced, and with the help of the PSK method, the minimum total transportation cost is obtained. An illustrative example will be presented to clarify the idea behind the proposed method. Finally, the talk will end with a comparative study, results, and discussion.

The role of optimization techniques in the present digital world

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In the present global era of digitalization process the data science playing a vital role to analyze the data in various forms like video, image, audio, text and other forms. The analysis of data can use various algorithms developed using machine learning concepts. Out of all the developed and developing algorithms, the algorithms developed and developing with optimization techniques which in turn helps to understand the levels in computer programming are taking the lead due to their advantages and accuracy in the data analysis process. Optimization is nothing but reaching to the desired set of values or almost near to the desired set of values. The iterative mathematics, numerical methods and stochastic processes are the key concepts in understanding and analyzing the any optimization problem or technique. In this article various types of optimization techniques were discussed in detail with their suitable applications with comparison of different optimization algorithms based on their performance in acquiring the desired data features. And also the concept of double optimization is introduced. The concept of double optimization can have its own advantages as well as limitations with respect to the various analyzing parameters like memory, speed, efficiency, accuracy and final or overall performance of the desired machine learning algorithm developed. Even though there are different number of efficient optimization algorithms available, it is required to go with double optimization sometimes. Especially when we are dealing with a complex type of data analysis problems like big data analytics comprised of large video or picture frames. Finally in order increase the efficiency to the desired value of the complex problems with compromised limited decrease in speed performance, the double optimization machine learning algorithms can be preferred to deal with present challenging high rate of data analytics to make the entire globe in a digital friendly environment.

An introduction of swarm intelligence algorithms

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Optimization belongs to almost every domain of science, research, and technology. It provides a common framework to model a broad range of problems through the objective function and some specific constraints. Derivative information plays a significant role in the optimization process by providing the directions of the optimal regions. However, the non-differentiable objective functions restrict the derivative-based optimization algorithms into their limitations. Fortunately, the swarm-based meta-heuristic algorithms effectively deal with this issue through their inherent non-derivative search mechanisms. As a result, these algorithms find several real-world applications in all scientific domains. In recent days, these algorithms are playing a central role in the development of several AI technologies.

Analysis of homogeneous-heterogeneous reactions in a micropolar nanofluid past a nonlinear stretching surface: Semi-analytical approach

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In the present scenario, the application of reactive agents in industries plays a vital role in the production processes of various materials such as paper production, drawing of wires, etc. Keeping in mind it is necessary to discuss the application of heterogeneous and homogeneous chemical reactions in a micropolar nanofuid fow over a stretching surface where the sheet is considered to be nonlinear. In addition to that, the inclusion of heat generation/absorption in the energy equation of an electrically conducting fuid also afects the fuid fow phenomena. In the present analysis, the Maxwell model thermal conductive is considered with Fe_3O_4, CuO nanoparticles, and water is treated as base fuid. It is very much transparent that the nonlinear dimensional form of the PDEs gets transformed into ODEs and a semi-analytical approach is employed, i.e., Adomian decomposition method (ADM) for those transformed ODEs. The computation for several characterizing parameters is obtained using the mathematical package MAPLE and these are displayed via graphs and tables. An excellent concurrence with the earlier established result is found which validates the result with the current methodology.

Mitigation of stragglers from the heterogeneous clusters

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Cloud computing has emerged as a new way of sharing resources. MapReduce and other computation models have become the de facto standard for cloud computing, which helps with data-intensive computation in a distributed manner. Open-source frameworks such as Apache Hadoop, Spark, Storm, Samza, and Flink allows the implementation of different computation model on the cluster of nodes. An environment with varying generations of hardware (node) and different configuration of resources raises heterogeneity in the Hadoop environment. Today heterogeneity has become common in industries as well as in research centers. The current open-source framework implementation assumes that nodes in the environment are homogeneous and distribute the workload evenly among these nodes. This homogeneity assumption creates a load imbalance among the nodes in the heterogeneous Hadoop environment, leading to stragglers. Stragglers are the available nodes in the environment, but their performance is abysmal. Stragglers may occur due to many reasons, including software misconfiguration, hardware degradation, overloaded nodes, and resource contention. A distributed computing environment with varied generations and different configutaion of hardware expedites and splits a job into several tasks executing in parallel. Nevertheless, it uses extravagant resources of the cluster. It delays job execution and indirectly degrades its performance due to slow-running tasks (stragglers). New policies need to be proposed that will balance the nodes among the nodes in the cluster, improve the performance of existing open-source frameworks, map task data locality, and reduce job turnaround time in heterogeneous clusters.

Improved power delivery scheme for BLDC motor drive using hybrid boost SEPIC converter

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In modern electronic appliances DC-DC converters are widely used for power conversion due to their efficiency and reliability. Therefore, in this work, we have deployed converter fed BLDC motor drive topology in order to improve the overall efficiency of the said motor drive. These converters consists of power electronic switches as well as passive components like inductors and capacitors, here in order to reduce conversion losses, resistors are generally avoided. In literature, various types of converters starting with Buck, Boost, Cuk, SEPIC, Push-Pull, Forward buck/ boost have been studied, from which it has been found that both power factor and efficiency have been increased by using SEPIC converter. In this present research we have introduced Hybrid SEPIC converter instead of classical one. The hybrid Boost-SEPIC topology is integration of boost converter with SEPIC converter topology with the help of a single switch. The proposed converter provides higher voltage gain with lower voltage stress across the single switch. The design consideration of selecting the circuit elements for the hybrid topology has been presented. The analysis of the proposed converter fed BLDC drive has been done in continuous conduction mode. Also, the characteristics have been verified with MATLAB simulations. Finally, the performance of the said converter fed drive topology is compared with classical SEPIC fed BLDC drive. Here the parameters taken into consideration for comparison are the voltage gain, voltage stress across switches and total harmonic distortion in the output voltage of the converter.

A phase change problem with a size-dependent thermal conductivity

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Here, we present a mathematical model of a parabolic partial differential equation in a time-dependent domain governing a phase change process. This problem includes moving phase change material and a size-dependent thermal conductivity. A numerical solution of the problem is proposed by using finite difference scheme. We also present the consistency, stability and convergency of the scheme for the considered problem. For a particular case, the comparison of our result with the exact solution is shown to demonstrate the accuracy of the proposed solution, and it is found that our calculated results are sufficiently closed to the exact results. The effects of various parameters on the phase change process are also discussed.

Corporate green reporting practices in polluting industries of India, USA and China

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In recent times, there is a substantial tilt of polluting industries in disclosure of non-financial information as opposed to traditional accounting practices. Green Reporting Practices are an important tool for providing information regarding environmental, social and governance (ESG) parameters for sustainable development. There is a tendency of companies towards disclosure of favorable information rather than unfavorable information for various stakeholders. This study aims to identify the relationship between green reporting practices and financial performance.This study evaluates annual and sustainability reports for a five year time period of 380 Indian, 400 Chinese and 400 USA listed companies from Bloomberg database for five highly polluting industries as per Global Reporting Initiatives (GRI) guidelines. The industries are mining, oil and metal extraction, chemical, pharmaceutical, fertilizer and agrochemical and cement.

The general form of the model used for the analysis of total sustainability is as follows:

Total Disclosure score = f (RoA, control variables).

General mathematical expression of the model is: $Yit = \beta iXit + \alpha\ i + \mu it$

Where, Yit is the dependent variable at time t

Xit is the independent and control variable at time t

βi is the coefficient αi is a group-specific constant fixed over time

μit is an idiosyncratic error term.

This study confirms the legitimacy theory that advocates the need for reporting on sustainability practices for economic prosperity as well as the well-being of the future generations to come. The outcome of the study suggests that the size of the firms is directly proportional to the transparency the firm brings in sustainability reporting. The variables RoA and gearing ratio do not have any influence on the total sustainability score, and the publication of a separate sustainability report by the firm does have a positive significant influence on the sustainability score earned by the firms.

Mathematical and visual understanding of a deep Learning model towards m-agriculture for disease diagnosis

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Disease classification based on leaf disease spots is necessary for increased agricultural productivity. Traditional disease prediction techniques used by farmers will grow more expensive, labour-intensive, and time-consuming. In order to detect and predict disease at an early stage without manual intervention, an intelligent system is needed. Artificial intelligence and ICT tools enable farmers to analyse crops more effectively, with less effort, expense, and time. This research work offers a thorough examination of current computer vision and deep learning applications in agriculture, highlighting the significance of disease classification and detection utilizing datasets of images of Apple leaves that are available to the public. An innovative classification method for identifying Apple diseases is proposed and put into practice as a mobile application. A mobile phone model receives the supplied image. Since different models used in different applications typically tend to be larger and more complex, it is desirable to have a model with lower size and complexity. Depth wise and pointwise convolution with stride 1 or 2 come after a single convolution layer. Convolution is applied depth- and point-wise, and then the batch norm and ReLU are used. Convolution is made faster and the computational complexity is lower as a result. The suggested framework is used with the multispace image reconstruction inputs. A fresh set of images, including the gradient images, are created using the multispace image reconstruction inputs. High-level semantic information are then recovered from the original and reconstructed images using convolutional and depth wise separable convolutional layers. The softmax classifier is utilized for classification. Mathematical calculations were used to determine the hyper-parameters and computational cost. According to the experimental findings, the color image exceeds other visual representations, including the reconstructed image, in terms of accuracy of 99.6% with the least amount of size and complexity.

Effect of Al_2O_3 nanoparticles on microstructure and mechanical properties of friction stir-welded dissimilar aluminum alloys AA7075 and AA6061

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In this research, a defect-free dissimilar weld joint of AA7075-T6 and AA6061-T6 reinforced with Al_2O_3 nanoparticles was fabricated via friction stir welding (FSW). The influence of tool rotational speed (700, 900 and 1100 rpm), traverse speed (40, 50 and 60 mm/min) with varying volume fractions of Al_2O_3 nanoparticles (4%, 7% and 10%) on microstructural evolution and mechanical properties were investigated. The augmentation of various mechanical properties is based on the homogeneity of particle dispersion and grains refinement in the SZ of the FSWed joint. The findings revealed that the remarkable reduction in grain size in the SZ was observed owing to the incorporation of Al_2O_3 nanoparticles produces the pinning effect, which prevents the growth of grain boundaries by dynamic recrystallization (DRX). The increasing volume fraction of Al_2O_3 nanoparticles enhanced the mechanical properties such as tensile strength, % elongation and micro-hardness. Agglomeration of particles was observed in the SZ of the FSWed joints produced at lower tool rotational speed of 700 rpm and higher traverse speed of 60 mm/min due to unusual material flow. Homogenous particle dispersion and enhanced material mixing ensue at higher rotational speed of 1100 rpm and lower traverse speed of 40 mm/min exhibit higher tensile strength and micro-hardness.

Applications of deep learning in material science

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One of the areas of materials data science that is expanding the fastest is deep learning (DL), which has applications in the atomistic, image-based, spectral, and textual data modalities. DL enables automated feature identification and unstructured data analysis. The recent emergence of massive materials databases has accelerated the use of DL techniques, particularly in atomistic prediction. The development of image and spectrum data, in contrast, has largely benefited from synthetic data made possible by high-quality forward models and generative unsupervised DL techniques. Processing-structure-property-performance aspects are highly different in terms of the length and time scales of material phenomena and structures, which increases complexity.

For example, comprehensive knowledge of an element's atomic coordinates, the microscale spatial distribution of phases (microstructure), fragment connections (mesoscale), pictures, and spectra are all examples of structural information. Establishing connections between the aforementioned elements is a difficult process. Here this gives a high-level overview of deep learning techniques, then go into great detail about current advancements in deep learning for atomistic modelling, materials imaging, spectral analysis, and natural language processing.

Filtering methods infant brain MR images

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Medical image analysis and diagnosis methods have significantly improved over the past few decades and have taken on increasing importance in clinical practice. Diagnostic images obtained from various modalities, such as computed tomography and magnetic resonance imaging, are the most often used diagnostic resources. With a specific focus on neonatal brain imaging, neonatal neuroimaging is a growing diagnostic imaging field. The newborn brain MRI can identify the neonatal brain growth and several neurological abnormalities. The majority of the items in MRI pictures are low contrast, which makes it challenging to capture an accurate image. Noise generates ambiguous representations that affect the detection and diagnosis of diseases as well as mortality, resulting in significant losses. The basic goal of medical image de-noising is to accurately reconstruct the original image from its noisy observation while preserving the essential graphical elements, like textures and edges. Additionally, de-noising of medical images that aid medical professionals in accurate illness analysis is required. In this study, de-noising techniques for MR images of the neonatal brain are systematically analyzed. Each method is evaluated in terms of its results, disadvantages, and advantages. This study examines the effectiveness of various image de-noising techniques for T1- and T2-weighted neonatal brain MR images. Using several statistical measures such as PSNR, SSIM, and MSE etc.

Novel design of multiband slotted microstrip patch antenna for X and Ku -band applications

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Microstrip patch antenna execution is a milestone in wireless communication systems and is progressing to accomplish the challenging demands of the new breed of antenna technology. These antennas are broadly used in current wireless communication systems because of their inherent facilities of low profile, light weight, consistent design, low cost, ease of fabrication, and ease of integration with circuits. This article takes research on a novel design of multiband slotted microstrip patch antenna. It portrays a multi ultra wide band compact and optimized antenna with double F- slots, four rectangular slots, and side slits on the patch using partial Ground. The proposed multiband microstrip patch antenna can resonate at seven unique frequencies between 8 GHz and 19 GHz in X and Ku bands and achieve the reflected power of −23.3017 dB, −33.8336 dB, −14.6094 dB, −21.9835 dB, −19.2680 dB, and −18.7852 dB at 8.675 GHz, 12.35 GHz, 14.225 GHz, 15.65 GHz, 18.275 GHz, and 18.95 GHz, respectively. The obtained bandwidth is good. A maximum directivity and gain of 4.72dB and 4.5535dB is obtained at the resonating bands. Furthermore, the effectiveness of proposed multiband patch antenna has been verified through surface current distribution and radiation efficiency of measured results. The low size, weight and cost of this geometry of this antenna make it attractive for Radar engineering, police radars for measuring the speed of the vehicles, for military applications, for navigation purposes and in determining the weather forecast and Satellite broadcast communication, space-crafts, wireless computer networks.

Despeckling techniques for speckle-noise suppression in SAR images

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The Synthetic Aperture Radar (SAR) is a special kind of RADAR i.e. employed to conceive 2D image or 3D recreation of objects. With the greater capabilities the SAR works very precisely all-time without getting affect of the any types weather. The SAR prototypes majorly function with the greater scale of the RADAR signals generating properties. The primary concern of SAR images is speckle-noise which is inherent properties. The creation of the speckle-noise is granular form and nature is multiplicative. To remove the granular pattern from the radar images is a primary motive of the researchers because it is reduce the quality of obtained images and make it difficult in feature extraction and the classification. The various speckle-noise reduction methods have already been developed by the researchers but most of the techniques only remove the speckle-noise without preserving the fine details of the satellite images like edges, texture, etc. The fundamental and most significant step is to analyze the effect of granular pattern in radar images before despeckling. The performance metrics assist to determine and quantitatively validate the despeckled model which is shows their robustness. The performance metrics has been classified into two categories such as with-reference and without-reference indexes. For measuring the texture feature of the despeckled images using entropy and contrast. The speckle-noise reduction methods are basically classified into three parts such as spatial-based, wavelet-based, and transform-based. All despeckling methods have its individual pros and cons but most effective and precise results can be obtained by using wavelet-based method. Therefore, the proposed method is the fusion of the anisotropic diffusion, discrete wavelet transform, and method-noise thresholding and has the ability to remove the speckle-noise precisely with the preservation of the important details of the processed images.

Explore indigenous plant derived biomaterials in in- vitro

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The emerging field of biomedical engineering is now possible to exploit biomaterials because of advance technology and ground-breaking research in the field of tissue culture and regenerative medicines. In addition to biomaterial, several new tools and techniques has made it possible to simulate complex aspects of human physiology, pathology, and drug responses in in-vitro. The broad applicability of biomaterials and extensive use of the Biomatrix is discussed in this study. In present biomaterials are very expensive so our aim to develop plant based cost effective biomaterials and make tissue engineering luxurious. In present study we focused on indegiounous plant based biomaterials i.e. Aloe Vera which has centuries documented as a valuable medicinal plant in India. We focused on L929 and HeLa cell line in in- vitro by exploiting Aloe Vera Hydrogels coating Vs non coating and here, we run gelatin coating plate as positive control. Further we confirm cell viability in in-vitro by exploiting Aloe Vera Biomatrix. In addition, we also performed comparative study between newly developed Aloe Vera Biomatrix and commercially available matrices i.e. Matrigel it is available from BD Bioscience. We continuously monitored and on 8th day we observed L929 and HeLa cell line have high tendency to form spherical structure in plant based Biomatrix. The average of spheroid formation in Biomatrix, Matrigel and gelatin is 100%, 93.3% and 86.6% respectively. Our plant based Biomatrix is non- toxic when exploiting with L929 cell line (mouse fibroblast) and HeLa cells (Human Cancer cell line). So, we can validly conclude that our plant based biomatrix is more significant then synthetic biomatrix and cells are growing faster in coated surface. These Biomaterial based Hydrogels films can be used for various applications including tissue regeneration, Stem cell based Therapies, wound healing etc. Furthermore, it can also use as alternative of animal model.

Effect of concentration on lattice strain, dielectric properties and activation energy of $CoFe_2O_4/BaTiO_3$ nanocomposites

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The aim of this work was to develop the better combination of $CoFe_2O_4$ (CFO) and $BaTiO_3$ (BTO) nanoparticles with enhanced dielectric properties. For this purpose, CFO/BTO nanocomposites at (0, 20, 40, 60, 80, and 100) wt% were synthesized using solid state method. The structural, optical and dielectric properties were investigated using the X-ray diffractometer, UV–Vis spectroscopy, and LCR meter respectively. The crystallite sizes of CFO and BTO were found to be 5.6 nm and 36.2 nm, respectively, by Scherrer's formula. The uniform and nonuniform strains were determined using Hall method. The absorption edge and energy band gap were estimated from UV-B to visible range. The FESEM and EDX were used to confirm the crystallite size and pure formation of CFO/BTO nanocomposites with different concentration of BTO. The dielectric constant, dissipation factor and activation energy were observed higher for 20 wt% BTO as compared with other wt%, which is optimum combination of CFO/BTO nanocomposites.

Influence on electrochemical impedance and photovoltaic performance of natural DSSC using terminalia catappa based on Mg-doped ZnO nanoparticles

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In this paper, we report the successful fabrication of a novel dye-sensitized solar cell (DSSCs) using Mg doped ZnO as photoanode and natural dye Terminalia catappa as sensitizer. We synthesized Mg doped ZnO nanoparticles at different Mg concentrations (2%, 4%, 6%, and 8%) by employing a simple solvothermal route. The structural, morphology, composition and optical investigations of synthesized Mg doped ZnO nanoparticles are carried out using XRD, FE-SEM, EDAX, TEM, SAED, FTIR and UV-visible measurements. The XRD results confirmed the formation of hexagonal-wurtzite structure for the Mg doped ZnO nanoparticles and increase of crystalline size with increasing dopant concentration up to 6% is observed. FESEM analysis indicated a gradual change in the surface morphology with increasing Mg concentration and the size of the nanoparticles are slightly reduced at higher Mg concentration. The HRTEM images and SAED pattern also confirmed the formation of wurtzite hexagonal phase of ZnO. The band gap energies calculated from the UV-visible spectra using Tauc's plots indicated decrease of band gap energy with dopant concentration. The DSSCs fabricated using Mg doped ZnO photo-anodes and Terminalia catappa sensitizer showed higher efficiency at higher Mg concentration and observed increase in efficiency is discussed based on slower charge carrier recombination and higher carrier life time as evidenced from the electrochemical impedance analysis.

An appraisal of bacteriophage isolation techniques from environment

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Being valuable models for the study of eukaryotic viruses, and more importantly, natural killers of bacteria, bacteriophages are being tapped for their potential role in multiple applications. Bacteriophages are being sought for bacteriophage therapy due to rising antimicrobial resistance among pathogens. Various methods for isolation of bacteriophages from environmental sources like water, soil, and air are comprehensively described. Given the potential differences in bacterial community dynamics and microbial genome development caused by bacteriophages' uncontrolled escape throughout diverse applications, the use of genetically altered bacteriophages may be problematic.

A better alternative is to search the natural environment for bacteriophages with characteristics suited for various purposes. Bacteriophages each have a distinct bactericidal function, protein composition, and habitat. The first hurdle to overcome for a successful application is the isolation of particular bacteriophages, which has highly varied time requirements and success rates.

We go over the techniques for removing bacteriophages from the water, sewage, soil, and air habitats in this overview.

Confidence intervals of a loss based PCI S'pmk using exponentiated-exponential distributed quality characteristics

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Process capability indices (PCIs) are most effective devices/techniques used in industries for determining the quality of products and performance of manufacturing processes. In this article, we consider the process capability index S'pmk which is based on an asymmetric loss function (linear exponential) and is applicable to normally as well as non-normally distributed processes. In order to estimate the PCI S'pmk when the process follows exponentiated exponential distribution, we have used ten classical methods of estimation and the performances of these classical estimates for the index S'pmk are compared in terms of mean squared errors (MSEs) through simulation study. Also, the confidence intervals for the index S'pmk are constructed based on four bootstrap confidence interval (BCIs) methods. A simulation study is performed in order to compare the performance of these four BCIs in terms of average width and coverage probabilities. We use two published data sets related to electronic and food industries to illustrate the performance of the proposed methods of estimation and BCIs. All the data sets show that width of bias-corrected accelerated bootstrap interval is the lowest among all other considered BCIs.

Development of performance characterization in VSI-fed induction motor drives using random PWM

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Any industrial or power sector application requires a pulse width modulation (PWM) inverter. Industrial drives, in particular, are highly concerned with industrial standards. To satisfy the voltage source inverter (VSI) drives objects, a variety of PWM approaches are used, including inverter DC input voltage utilizations, suppression of higher and lower order of harmonics, as well as spreading harmonics, acoustic noise reduction, among others PWMs. One of the better approaches for minimizing noise on voltage source three-phase inverter-fed drives is random PWM (RPWM). Despite the fact that these described RPWM approaches are superior in terms of harmonic spreading and mitigation, these methods are unable to achieve the target DC-link utilizations. As a result, the focus of this paper is on combining multicarrier RPWM principles with space vector PWM (SVPWM) to produce multi-carrier random SVPWM (MCRSVPWM). The suggested PWM generates random unsystematic triangle carrier (5 kHz, 2.5 kHz, 1.25 kHz, 1 kHz) based pulses, whereas the traditional random PWM techniques use a fixed frequency triangular carrier to generate random pulse positions. Asynchronous induction motor driving simulation is carried out using MATLAB/Simulink. The proposed MCRSVPWM is put to the test with a 2kW six-switch VSI-fed induction motor drive system.

Innovative walking aids for people with vision problems

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Robotics has been a blessing in disguise for humans at large for its wide applications and employability in various situations. The Gopalan Tinkering Laboratory has setup various models that help to incorporate various innovative methods for easy and cost-effective solutions. Walking for people with vision problems has always been a challenging task, and various tools are available in the market that employs smart technologies. However, the major hindrance for those technologies for the common people lies in its cost. The innovative walking stick and smart vision glass can be a formidable tool for negotiating the obstacle that will not only help them to lead a normal life, but the cost-effective model will be massive boon for developing nations at large. The models incorporate materials that are easily available and the applicability of Arduino Uno and Arduino Nano micro-controllers gives leverage for technology enabled solutions at affordable price. The model requires 9V batteries, IR sensors, Arduino Uno and Arduino Nano microcontrollers, jumper cables and a plastic rod, a cap and a sunglass for the set up. It takes only a few minutes for assembling this model and can easily be serviced using nominal tools. Compared to other available models, this walking assistive model can usher in new hopes for the visually disabled. This innovative walking assistance can be a game changer for the needy, and efforts are underway to market it commercially for greater reach.

Vetiver floating wetlands for rhizoremediation of dairy effluent

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Vetiver based floating wetlands (VFWs) are proven as effective phytoremediation technology for treatment of wastewaters. The key purpose of this study was to study the utilization of VFWs as tertiary treatment in dairy industry wastewater treatment plants for the removal of solids, BOD, COD, nitrogen and phosphorus. Dairy wastewaters were collected from M/s AAVIN, Tamil Nadu after the biological treatment. Experiment was conducted with different concentrations of dairy wastewaters (0, 25, 50, 75, and 100 %) in 50 L tanks for 60 days. Tanks were maintained with a set of VFWs and another set as unplanted controls in a greenhouse. During the experimental period, VFWs could thrive in 100% dairy wastewater (71% survival), removed 67.3% BOD and 57% COD from wastewaters. The highest total nitrogen removal of 46% was recorded in 25% dairy wastewater. Response surface methodology (RSM) models indicated significance of Vetiver based systems on the removal of BOD and COD. Overall, this study revealed that VFWs has the potential as a green technology for dairy wastewater treatment.

***Figure:** RSM depicting the effect of VFWs on removal of COD from dairy effluent*

Coarse-grained configurational polymer fingerprints for property prediction using machine learning

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In this work, we present a method to generate a configurational level fingerprint for polymers using the Bead-Spring-Model. Unlike some of the previous fingerprint- ing approaches that employ monomer-level information where atomistic descriptors are computed using quantum chemistry calculations, this approach incorporates con- figurational information from a coarse-grained model of a long polymer chain. The proposed approach may be advantageous for the study of behavior resulting from large molecular weights. To create this fingerprint, we make use of two kinds of descrip- tors. First, we calculate certain geometric descriptors like Re2, Rg2 etc. and label them as Calculated Descriptors. Second, we generate a set of data-driven descriptors using an unsupervised autoencoder model and call them Learnt Descriptors. Using a combination of both of them, we are able to learn mappings from the structure to various properties of the polymer chain by training ML models. We test our fingerprint to predict the probability of occurrence of a configuration at equilibrium, which is approximated by a simple linear relationship between the instantaneous internal energy and equilibrium average internal energy.

Production and optimization of chitosan from sclerotium rolfsii by submerged fermentation and evaluation of its antibacterial activity

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Chitosan (polyglucosamine) is derivative of a natural and biodegradable biopolymer of chitin which is found naturally in fungal cell walls. Chitosan and its derivatives have attracted much commercial interest with regard to medical, pharmaceuticals, aggriculture and industrial application due to its interesting properties such as biodegradability, biocompatibility and their low toxicity. Hence the study is focused on production and optimization of chitosan by submerged fermentation (SMF) and evaluation of its antibacterial properties. Chitosan production using Sclerotium rolfsii isolated from soil sample was carried out by SMF using Czapek dox broth supplemented with different carbon sources at 3% and incubated for 7 days. The yield of chitosan was more when sucrose is used as a carbon source (130mg/g) and chitosan was characterized by FT-IR Spectroscopy, SEM and XRD. Screening of antibacterial activity of chitosan was done by well diffusion method against some of the bacterial cultures. Among the bacteria tested Salmonella typhi showed greater sensitivity towards the chitosan followed by Staphylococcus aureus and Bacillus cereus, Klebsiella and Escherichia coli.

Increasing physical layer security of visible light communication using hyperchaos

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Visible Light Communication (VLC) systems have relatively higher security compared with traditional Radio Frequency (RF) channels due to line-of-sight (LOS) propagation. However, they still are susceptible to eavesdropping. This paper deals with a hyperchaos-based security measure to increase physical layer security from eavesdroppers. A fourth-order Henon Map is used to scramble the constellation diagrams of the transmitted signals. The scramblers change the constellation symbol of the system using a key. That key on the receiver side de-scrambles the received data. The presented modulation scheme takes advantage of a higher degree of the map to isolate the data transmission to a single dimension, allowing for better scrambling and synchronization. A sliding mode controller is used at the receiver in a master-slave configuration for projective synchronization of the two Henon maps, which helps de-scramble the received data. The data is only isolated for the users aware of the key for synchronization, providing security against eavesdroppers. The proposed VLC system is compared against various existing approaches based on various metrics. An improved Bit Error Rate and a lower information leakage are achieved for a variety of modulation schemes at an acceptable Signal-to-Noise Ratio.

Nd: YAG laser irradiation consequences on calcium and magnesium in human dental tissues

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Purpose: To investigate the percentage (%) of metals such as calcium (Ca) and magnesium (Mg) in human dental tissues (enamel and dentin) that varies as a function of energy density when irradiated with an Nd: YAG laser (1064 nm, 5 ns, 50 mJ) in ambient air for an optimized number of pulses (80 shots).

Methods: By using laser-induced breakdown spectroscopy (LIBS), the laser energy density for ablation threshold of Ca in enamel and dentin tissue was calculated. Optical and scanning electron microscopy (SEM) techniques were used to examine the morphological alterations of dental tissues after laser treatment. Moreover, the elemental compositional analysis was performed by employing energy-dispersive X-ray spectroscopy (EDX).

Results: The ablation thresholds for Ca in enamel and dentin tissue were found to be 1.41 J/cm^2 and 0.38 J/cm^2, respectively. Surface and structural analyses suggest that dentin has pores and a spongy structure that is easy to ablate at low laser energy density, while enamel is calcified and its building blocks rods/prisms are difficult to ablate, requiring high energy densities. The decrease in atomic % of Ca in enamel is greater than in dentin, while the trend is vice versa for the reduction in Mg atomic % as laser energy density increases.

Conclusions: The ablation threshold of Nd: YAG laser for Ca in enamel is significantly four times higher than that of dentin. Morphology of irradiated enamel surrounding regions shows thermal damage, whereas dentin ablation has been achieved without melting. The stable Ca/Mg ratio in dentine at appropriate laser energy density makes the Nd: YAG laser safe and sound for its treatment for clinical applications like caries prevention, cavity preparation, and restoration, killing bacteria, and activating tissue growth.

Thermal consequences of dynamic phantom AdS black hole by utilizing barrow and logarithmic corrections

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We will interpret the thermal consequences of the dynamic phantom Anti-de sitter (AdS) black hole by utilizing Barrow and Logarithmic corrections. Both techniques are compatible and lead us to better results. In this work, we first examine the pressure, how it behaves using barrow corrected entropy, and Bekenstein entropy with the impacts of the cosmological parameter as well as electric charge and magnetic charge the pressure gets increases using barrow in comparison with Bekenstein entropy. When we compare it to the results of logarithmic corrections, we can conclude that pressure is more accurate using barrow entropy instead of logarithmic corrected entropy. Our major analysis is the comparison of the barrow and logarithmic corrected entropies on dynamic phantom AdS black hole and in our analysis, we find better results by using barrow's corrected entropy as compared to logarithmic corrected entropy. Furthermore, we compare different significant thermodynamical amounts like entropy, specific heat, Helmholtz free energy, and Gibb's free energy. In the same line, we talk about the stability of dynamic phantom AdS black holes at constant pressure and volume. We have also discussed here γ the ratio of specific heat at constant pressure and volume. Gamma γ shows the maximum value at 1 with the barrow entropy and shows fluctuation with logarithmic corrected entropy. Moreover, we discuss the behavior of Gibbs free energy and Helmholtz free energy for specific values of parameters, initially both (Gibbs free energy and Helmholtz free energy) show instability. We also observe that Gibbs free energy and Helmholtz free energy do not only depend upon lambda but also on electric charge and magnetic charge. One can analyze those dynamic phantom AdS black holes becoming more stable by increasing the worth of the cosmological constant.

Fuzzy acceptance sampling plan for transmuted Weibull distribution

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In conventional sampling plans, the rate of the fraction of faulty items is supposed and fixed, but in some practical situations, this value is not fixed but fuzzy. To attain real and flexible value, we used transmuted Weibull distribution in a fuzzy environment. Fuzzy transmuted Weibull distribution is based on fuzzy set theory. According to our investigation, transmuted Weibull is not used in acceptance sampling in a fuzzy environment. The improvement of this research is to evaluate the vague portion of malfunctioning items ($\tilde{p}$) based on the probability distribution function of transmuted Weibull model and attain a fuzzy operating characteristic curve. First-time transmuted Weibull distribution is applied in acceptance sampling plan for cases where the quality of the product is imprecise. Therefore, fuzzy statistics has been used in this design instead of classical statistics. The results are described by numerical examples and an application of real data is considered for illustration.

Environmental friendly synthesis of multifunctional nano agro chemicals

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Food safety and security is of outmost importance for whole world. With increasing population the production of quality food to cater the need of people is one of the significant issue to coup with. The indiscriminative use of commercially available agrochemicals for the production of food is posing a serious threat to environment. Herein, we report the use of green chemistry to produce ago Nano chemicals as a safe alternative to commercially available pesticides and fertilizers. The Iron based multifunctional nanomaterials were prepared using ecofriendly process for their application as both pesticides and micronutrient fertilizers. Beside this their potential as catalyst to degrade various dyes in aqueous medium and as potent antimicrobials against water born bacterial pathogens were also assessed. These materials were tested in for various plants/crops including, lettuce, reddish, tomato and wheat. All the results were very interesting and could lead a way towards the use of these materials in agriculture sector in very small quantity. This will ultimately safeguard the environment as well as availability of good quality food for the coming generations.

Environmental monitoring in waterfowls via metal estimation

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Birds have been frequently used as bio-indicators of heavy metal pollution in the environment. In the ducks, concentrations of heavy metal contaminants were associated with their diet which also showed environmental quality. The present study was designed to assess the environmental quality of ducks. Samples were collected from rural (Village Lalian, Shakargarh) and urban (Shahdara) areas of Punjab, Pakistan. Different metals such as essential Sodium (Na), Potassium (K), Calcium (Ca), Iron (Fe), Zinc (Zn), Copper (Cu)) and non-essential heavy metals as (Chromium (Cr), Cadmium (Cd) and Mercury (Hg)), were detected in different organ of mallard (*Anas platyrhynchos*) and white pekin (*Anas platyrhyncous domesticus*). Both species were sacrificed and organs such as liver, kidney, muscles, and heart were separated. Samples were stored at 4°C. Later on all samples were chemically digested in aqua regia and analysed by Flame Absorption Spectrophotometer (FAAS). It was noticed that higher concentration of metals such as Na, K, Ca and Fe were detected in all the tissues of female mallard (*Anas platyrhynchos*) as compared to male mallard. While, in case of white Pekin (*Anas platyrhyncous domesticus*) ducks a higher levels of Na, K, Ca and Fe were detected in males as compared to females in all tissues except at few places. However, it was noticed that Zn, Cu, Cd and Cr were present in negligible amounts in both mallard (*Anas platyrhynchos*) and white Pekin (*Anas platyrhyncous domesticus*). Mercury (Hg) was not detected in any tissue of both the species from both sites. It was concluded the essential metals were present in high amounts in the different organ tissues. Moreover, the presence of heavy metals was higher in urban areas as compared to rural areas which showed the immediate effect of environmental exposure. It was recommended levels of metals in the environment needs to be regulated otherwise these metals affect the other living organisms via the food chain.

Optimum composition of developed additive-based insect-repellent paint

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Active compounds of Cymbopogon winterianius, Cymbopogoncitratus, Rosmarinus officinalis, Cedrus, and Eugenol, have been reported to have different insect repellant compounds. Control and development of natural insect repellent additive based decorative coating has driven this work to incorporate the essential oils with long chain fatty acids in water-based lab developed conventional paint. In this work, the Additive based Paint was formulated and its ability to repel different insects was determined. The optimum composition of developed additive-based paint was determined by three standard paint analyses which were adhesion, elasticity and insect repellency. As per challenge of Pigment powder and Polymer use for such paint is achieved by testing on Latest instruments. The best composition of additive in paint was found to be 15%. Where it able to repel Pavement Ants, non-biting Flies, Mosquitoes and Black field ant with 80% efficiency. It is envisioned that the formulated paint is effectively function as insect repellent thus as an alternative way to reduce the insect-borne diseases.

Ecological assessment of plant communities along environmental gradients of District Haveli, Azad Jammu & Kashmir, Pakistan

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The present study was conducted in District Haveli, Azad Jammu & Kashmir to investigate the plant species composition, distribution pattern, and formation of different plant communities under the influence of various environmental factors. The quadrat quantitative ecological techniques were used for the sampling of vegetation. Size of the quadrats i.e., 10m^2, 5m^2 and 1m^2 were taken for trees, shrubs and herbs respectively. Soil samples were collected and analyzed using different standard protocols from each quadrat. All the collected data were analyzed using Cluster Analysis, Two-way Cluster Analysis, Indicator Species Analysis, Canonical Correspondence Analysis and Detrended Correspondence Analysis of PC-ORD and CANOCO Software, respectively. Preliminary, a total of 169 plant species belonging to 62 families were recorded from the region. Based on habit, 18 species were shrubs (10.65%), 130 herbs (71.59%) and 30(17.75%) were trees species. The dominant family in the investigated area was Asteraceae which was represented by 22 numbers of species with a total share of 13.01%. Cluster Analysis and Two-way cluster Analysis classify all the recorded plant species and stations into four plant communities i.e., (i) *Olea-Debregeasia- Pteris vitata* Community, (ii) *Pinus- Rosa – Lespedeza juncea* Community, (iii) *Quercus- Desmodium-Convolvulus arvensis* Community and (iv) *Abies-Skimmia– Onychium japonicum* Community in the study area. Canonical Correspondence Analysis revealed that various environmental factors such as altitude, slope, soil pH, electrical conductivity, and organic matter have a significant effect on plant species distribution pattern, composition and formation of aforementioned plant communities in the regions. Deforestation and overgrazing should be reduced so that diversity of vegetation increases.

In-silico analysis of interacting pathways through KIM-1 protein interaction in diabetic nephropathy

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Objectives: Human Kidney Injury Molecule-1, also known as HAVCR-1 (Hepatitis A virus cellular receptor 1), belongs to the cell-surface protein of immunoglobulin superfamily involved in the phagocytosis by acting as scavenger receptor epithelial cells. The study focused on pinpointing the mechanisms and genes that interact with KIM-1.

Scope: In this study, crucial mechanisms were brought to focus using protein-protein interaction of networks, cantered on the top 5 genes interacting directly with HAVCR1. The associated signalling pathways and proteins serve to be a potential target for novel beneficial agents to decrease the burden of diabetic nephropathy resulting from chronic diabetes mellitus.

Results: Critical pathways that are dysregulated in diabetic nephropathy patients have been identified. These include Immune System (Total=237, $P < 0.05$), Innate Immune System (Total =140, $P < 0.05$), Cytokine Signalling Immune system (Total= 116, $P < 0.05$), Adaptive immune System and Neutrophil degranulation).

Methods: This in-silico study was done from March 2019 to December 2019. The Enrichment and protein-protein interaction (PPI) network carefully choose proteins. In addition, the diagrammed gene data sets were accomplished using FunRich version 3.1.3. It was done to unveil the proteins that may affect the regulation of HAVCR1 or may be regulated by this protein. These genes were then further considered in pathway analysis to discover the dysregulated pathways in diabetic nephropathy. The long list of differentially expressed genes is meaningless without pathway analysis.

Conclusion: The top 5 genes that are interacting directly with HIVCR1 include CASP3, CCL2, SPP1, B2M, and TIMP1 with degrees 161, 144, 108, 107, and 105 respectively for Immune system pathways (Innate Immune System, Cytokine Signalling Immune system, Adaptive Immune System and Neutrophil degranulation).

Gemifloxacin-transition metal complexes as therapeutic candidates: Antimicrobial, antifungal, anti-enzymatic and docking studies of newly synthesized complexes

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In the era of acquired microbial resistance (AMR), resulting in the ineffectiveness of antibiotics is of keen interest to researchers nowadays. Ten novel metal complexes of gemifloxacin have been synthesized by reacting it with essential and trace elements in a 2:1 ratio predetermined conducto-metrically. As these metals are either present in the body or co-administered as metallic supplements have the ability to alter the level of antibiotics. Therefore, Metal complexes of Gemifloxacin, an important member of the fluoroquinolone family, were synthesized. The possible coordination of gemifloxacin with these metals has been proposed by the electronic and elemental data obtained through molar conductance, elemental analysis, and spectroscopic techniques like ultraviolet-visible (UV-Vis), infrared (IR), and proton-nuclear magnetic resonance (^{1}H NMR) studies. In light of these studies, it has been revealed that Gemifloxacin behaves as a monoanionic bidentate ligand in complexation with metals. For in-vitro microbial studies, these newly synthesized complexes were tested against eleven different bacteria including Gram +ve and Gram -ve organisms, and against one fungal strain. The results were compared with the parent drug by applying ANOVA through SPSS software version 22. Therefore, it has been found that among all synthesized metal complexes, the G-M01 complex exhibits increased activity against B. subtitis, P. mirabilis, E. coli, K. pneumonia, and C. ferundii. Complex G-M02, G-M03, G-M04, and G-M10 show more pronounced activity than Gemifloxacin against S. aureus and M. luteus. Moreover, the binding orientations of the synthesized metal complexes into the binding site of the urease enzyme revealed that all the docked metal complexes oriented away from Ni bi-center and the inactivation of urease are due to their interaction with entrance flap residues.

Semi-transparent solar panels for smart buildings

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Considering the ongoing energy crises in developing countries such as Pakistan, fast, reliable, simple, and less time-consuming as well as cost-effective methods of producing electricity are required to replace the complicated procedures of generating electricity using conventional methods. Global demand for energy is increasing rapidly, because of population and economic growth, especially in emerging market economies. Cities consume more than two-thirds of the world's energy resources and are responsible for around the same share of CO_2 emissions. Buildings alone are responsible for 36% of global energy consumption and nearly 40% of total direct and indirect CO_2 emissions. At the current pace, the global energy use in buildings could double or even triple by 2050, as the world's population living in cities is projected to increase further in the next decades. As per new policy, all new buildings that will be occupied by public authorities should be nearly zero energy rated. This means that new buildings must generate their own energy from renewable sources and not be wholly reliant on traditional grid-based forms of fossil fuel related energy. Integrating photovoltaics in buildings represents a feasible solution towards energy efficient buildings and in order to achieve sustainable goals in cities, harvesting the full potential of the building (facades, windows) for renewable energy generation is required. Building integrated photovoltaics (BIPV) potential to integrate into the building envelope holds aesthetic appeal for architects, builders, and property owners and is a market sector that is expected to grow dramatically over the next 5–10 years. Among all existing photovoltaic technologies, 3rd generation solar cells have attracted substantial interest in BIPV due to reduced cost and possess a number of key advantages, including low weight, aesthetic value for architects and can be printed in any pattern making relatively low cost BIPVs, without significant compromise in efficiency.

Effects of COVID-19 pandemic on anatomy education of medical and dental students of Pakistan; A reality check

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Purpose: Virtual anatomy education was the only way that supported the learning process of the students during the forced lockdown time of COVID-19 pandemic. The intention of the current study was to apprehend the expected challenges experienced by the medical and dental students during their cyber anatomy classes.

Methods: This study was carried on 300 1st and 2nd year medical and dental students who joined their respective college in January 2020, and consented to participate in the study. A multiple choice questionnaire regarding their stance about these online classes was formed and student's feedback was taken.

Results: Most (80%) of the students longed for their traditional anatomy learning i.e., dissection courses, didactic lectures, interaction and motivation from their mentors and peer. The students blamed the learning without live dissections, models and microscopic slides for their lack of confidence. More than 80% students blamed inappropriate gadgets, absence of high-band internet connections, as possible barriers in their digital learning. Lack of self-motivation was considered by 66% students.

Conclusions: This situation of anatomy education while lockdown was not intentional and should not be taken as the silver bullet solution for a subject like anatomy. Although students had to face a lot of challenges but this shift to online mode went swiftly at the time of health crisis. This digital learning may extend for an indefinite period, the students' feedback will be helpful in bringing appropriate and timely modifications in digital anatomy education.

High-intensity circuit training for improving anthropometric parameters for women from low socioeconomic communities of Sikandarabad: A clinical trial

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Background: An alarming trend of sustained physical inactivity has been observed among women in socioeconomically disadvantaged areas, mainly due to the lack of time and high cost of gym facilities. Although physical activity essentially contributes to disease prevention, evidence supporting time-efficient exercise on anthropometric measures is limited. This study aimed to identify the effectiveness of interval-based high-intensity circuit training (HICT) on anthropometric measures and the nature of the relationship between these measures.

Methods: A single-group, quasi-experimental study was conducted in the community park of Ziauddin Hospital at Sikandarabad. Sixty women who were overweight and had sedentary lifestyles were recruited for a six-week HICT-based program conducted at 85%–95% maximum heart rate (MHR) on every alternate day. Outcome measures were assessed at baseline and at 6-weeks including anthropometric parameters (body mass index [BMI], body fat percentage [BF%], and waist-to-hip ratio [WHR]).

Results: The six-week HICT-based program demonstrated a significant reduction in BMI ($p<0.001$), BF% ($p<0.001$), and WHR ($p<0.001$). Reductions in the BMI mean from 27.3 ± 1.3 to 25.1 ± 1.4 and BF% mean from 31.9 ± 2.3 to 27.6 ± 2.4 were observed following 18 sessions of HICT. The effect of age on BF% and WHR was linearly significant ($p<0.001$) with increasing age (BF%) and WHR.

Conclusion: Interval-based HICT was an effective exercise regimen for improving BMI, BF%, and WHR. Furthermore, the exercise protocol was feasible and well tolerated, with no reported adverse events, and it could be easily implemented in real-world community settings. BF% and WHR were significantly influenced by increasing age; therefore, our findings support the importance of exercise implementation, especially with increasing age, for the maintenance of a disease-free healthy lifestyle.

Policy intervention and financial sustainability in an emerging economy: A structural vector auto regression analysis

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The purpose of the study is to observe the impact of policy intervention on financial sustainability using the structural vector autoregression (SVAR) analysis. The population of the study is the manufacturing sector of Pakistan, which is an emerging economy. Data for 249 firms operating in the manufacturing sector are taken, collected from Datastream from 2005 to 2019, with total observations of 2,400. To conduct the analysis, R software is used for its better visualization. Results show that firm performance, corporate governance, and sectoral policies have a positive and long-term impact on financial sustainability, whereas earning management and financialization not only have a negative impact, but this impact affects the operations of the corporate for a longer period. This study would be helpful for policymakers as it gives a framework for financial sustainability based on the policies and strategies developed by the sector.

Engineering strategies towards improvement in energy storage performance of ceramic capacitors for pulsed power applications

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The necessity for efficient and cost-effective energy storage devices to intelligently store the inconsistent energy out-put from modern renewable energy sources is peaked today. The scientific community is struggling in identifying the appropriate material system for energy storage applications. Countless contributions by researchers worldwide have now helped us identify the possible snags and limitations associated with each material/method. Energy storage has attracted great attention for its use in portable electronic devices military field. Different devices such as dielectric capacitors, supercapacitors, and batteries are used for energy storage. Of these, dielectric capacitors have high energy output, long life cycle, fast charging and discharging capabilities, working at high temperatures, and excellent fatigue resistance. The energy storage characteristics have been studied to be highly affected by various factors, such as grain size, optimized compositions, grain orientation, energy band gap, processing techniques, defect engineering, core-shell formation, interface engineering, electronegativity difference, the addition of additives, density, secondary phases, the difference of P_{max}-P_r, sample thickness, area of the electrode, testing frequency, and AC/DC conditions.

The data regarding these parameters/factors are scattered in the literature, and the aim of this study is to gather the data into a single paper that will be beneficial for the new researchers in the field of interest. Furthermore, control over and optimizing these parameters will lead to enhancing the energy storage properties.

An analysis of Maxwell fluid through a shrinking sheet with thermal slip effect: A Lie group approach

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Two-dimensional magnetohydrodynamic (MHD) boundary layer flow of an upper-convected Maxwell (UCM) fluid passing through the shrinking sheet is considered. The UCM fluid model is integrated with the effects of thermal slip, thermal radiation, and heat source-sink conditions. The severely nonlinear-governed partial differential equations (PDEs) are converted into ordinary differential equations (ODEs) by using the Lie scaling group approach. The changed ODEs are numerically solved with MATLAB's BVP4c tool, and the results are visually displayed.

Detecting Customer dissatisfaction on customer service chatbots

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Thanks to the development of Artificial Intelligence (AI), chatbots have been applied to various applications and redefined the online customer service, especially on e-commerce platforms. Chatbots are able to provide 24/7 constant service and potentially increase customer satisfaction on e-commerce platforms. When chatbots facilitate the process of customer service, these chatbots can be referred to as customer service chatbots. The development of chatbots rely heavily on machine learning (ML), which has been used for chatbot development, consumers' sentiment detection and classification for chatbot service quality (e.g., Feine et al., 2019; Wang et al., 2020; Yom-Tov et al., 2018). However, the dissatisfaction detection on conversational interactions has rarely been examined on customer service chatbots despite the detrimental influence on e-commerce platforms if dissatisfaction grows among consumers.

The research purpose of this study therefore is two folds. This study aims to identifies (1) the best AI based supervised ML algorithms in building a dissatisfaction detection model from conversational interactions between consumers and customer service chatbots, and (2) the most important dissatisfaction determinants using the best performing model with high predictability and credibility.

This study identifies the best AI based supervised Machine Learning (ML) algorithms in detecting consumer dissatisfaction during conversational interactions by utilizing the collected dataset. This study chooses seven supervised ML-algorithms for the predictive model, namely, discriminant analysis, logistic regression, k-nearest-neighbor (k-NN), classification tree, bootstrap aggregating ensembles (BAE), random forest, and neural network, because they are the frequently used classification techniques in the literature of artificial intelligence. This study provides theoretical and practical implications with a well-guided AI based supervised ML algorithms in detecting dissatisfaction on conversational interactions with customer service chatbots in e-commerce platforms.

Recent developments in Silica aerogels synthesis and applications

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Due to their exceptional characteristics and diverse uses, silica aerogels are acquiring increasing relevance and attracting substantial attention worldwide. Silica aerogels are highly porous and have a large surface area, low density, and heat conductivity. Typically, they are synthesized using the sol-gel approach, which requires the preparation of a sol comprising a precursor, a solvent, and a catalyst. Numerous variables, such as the ratio of precursor to solvent and the drying technique used, influence the final product's features. Due to the adaptability of synthesis processes and the ability to produce aerogels with tailored properties, silica aerogels have found several commercial applications and are being studied for their suitability in a variety of fields, including biomedical and aeronautical engineering. Despite their outstanding qualities, silica aerogels have their own limitations, such as brittleness and limited mechanical strength, which may be mitigated by fabricating their respective composites. This paper reviews the synthesis of silica aerogels using the sol-gel process, as well as the applications in which this exceptional material has been shown to be effective. Moreover, it covers the various composites that result in silica aerogels with enhanced physio-chemical properties, thereby resulting in widened applications.

Frequency dependent humidity sensing properties of imidizole-based sensor

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In this study the semiconducting properties of imidazole based organic compound 3- (4, 5-diphenyl-1H-imidazol-2-yl) phenol (DHIP) was investigated as an active sensing material used to fabricate surface-type humidity sensor. Aluminum (Al) having thickness of 100 nm was deposited on 25 × 25 mm^2 glass substrate by vacuum thermal evaporator. The gap between electrodes was kept ~ 40 micrometer (μm). The DHIP material was deposited between the Al-electrodes in order to form Al/ DHIP/Al sensor. The SEM image of the DHIP material shows that the structure consists of petals and needles like structure having pores and pore channels. The change in capacitance of the device as a function of relative humidity (RH) was measured at applied frequencies of 120 Hz and 1 kHz. The capacitance of the device was increased from 15 pF to 22 pF, and from 15 pF to 17.1 pF when humidity was changed from 45% RH to 95% RH at applied frequencies of 120 Hz, and 1kHz, respectively. The response time of the device was 22 seconds andrecovery time of the device was 54 seconds at applied frequencies of 120Hz.

Development of sustainable wireless resource model through shrewd neural network

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Due to an increasing number of wireless spectrums, the multiple frequencies are tangling the resource management process and therefore, results are the hindrance in operation. Incorporating deep neural network (DNN) to resolve the resource management issue sometime creates the in-formation leakage hassle. Though, DNN approach is a best solution but maintaining the wireless network resource sustainable without a shrewd Neural Network (NN) is much hard. Considering all these issues, a sustainable wireless resource management model has been proposed using the proactive measures of DNN. Using multi-layer perceptron (MLP) and Convolutional Neural Network (CNN), the random noises are introduced making the neural network more intelligent. The proposed model eagers to solve the high computational time problem of the iterative algo-rithm, i.e., stochastic weighted minimum mean square error (SWMMSE). The performance has been evaluated by conducting simulation using Python with TensorFlow. The result indicates that a differential privacy (DP) enabled CNN has come up with better performance comparing to the DP based MLP with different parameters.

Influence of complex conductivity on rotary penetration drag of the surface plasmon polaritons

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Recent developments in plasmonic sensors have surpassed optical sensors' efficiency due to their ultrasmall sizes, high sensitivity, and tunability. The investigation of the rotary drag of surface plasmon polaritons has greatly enhanced the sensitivity of plasmonic sensors.

In this article, Surface Plasmon Polaritons are theoretically investigated at the interface of Cesium (Cs) and Silver–silica nano-composite media. We considered a four-level N-type atomic system of Cs medium whose control optical response is coupled with $AgSiO_2$ medium. The SPPs are excited at the interface of metal (Cs) and dielectric ($AgSiO_2$ nanocomposite). The SPP waves propagate along the interface and inside the media. The intensity of the waves decays exponentially in each direction.

Significant enhancement in plasmon polariton's rotary drag is observed by changing the phase and amplitude of the complex conductivity of the Cs. The maximum rotary drag achieved at the propagation length along the interface is 4×10^{-10} radian. The achieved value of drag at the penetration depth of silica nano-composite is of the order of 4×10^{-11} radian, which is ten times smaller than the drag at the propagation length. Similarly, the value of drag achieved at the penetration depth of Cs is in the order of 4 pico-radian, which is twenty times smaller than the drag at the propagation length and ten times smaller than the drag at the penetration depth of silica nano-composite. The enhancement in rotary drag of Surface Plasmon Polariton at the propagation length and penetration depths may find significant applications in sensor devices, photo-imaging, and device designing technologies.

Constraint blind image deblurring

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The aim of the blind image deblurring is to recover sharp image from a blurred one without having much information about the blur kernel. Furthermore, most of the time we need that the intensities of the deblurred image are strictly non-negative.

But it is observed that the solution by existing numerical techniques may yield results which are not necessarily positive. These negative intensities generates notable amounts of dark space in restored images. In this talk, we present a model for mean curvature-based blind image deblurring problem. The proposed model not only ensures a strictly positive result but also limits the upper boundary of the image intensity values, keeping them within a prescribed range. The main idea is to convert the mean curvature based constrained image deblurring problem into unconstrained one then introducing the Lagrange multiplier. To solve the resulting non-linear partial differential equations new numerical algorithms are presented and compared with the existing numerical techniques.

Demystifying the role of genetic component in the development of Autism Spectrum Disorder (ASD)

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Autism Spectrum Disorder (ASD) is the most common serious neurodevelopmental disorder globally. This is considered highly complex since it has diverse etiology with multiple factors apparently associated with its appearance, while none of them reveals to be totally responsible for its development. This condition is particularly characterized by social communication difficulties and repetitive behaviours. Its development is believed to be triggered by both genetic and environmental factors. Not only a strong genetic component is largely responsible for progression of this disorder, role of other diseases has also been suggested in deterioration of the condition according to some recent studies. The hypothesis of involvement of multiple genes at different stages creates a complex and relatively inapprehensible picture. An alternate approach is to select genes which code the proteins that play prominent role in development of autism. Moreover, many studies emphasize specific regions of chromosomes seeking the probability of the corresponding genes being related to the observed characteristics of the disease. A considerable number of involved chromosomes suffer translocations and inversions which result in interruption of genes leading to deletions and duplications which are responsible for differences in gene expression. Different candidate genes related to idiopathic autism will be discussed with a particular emphasis on those related to brain metabolism.

Sustainable development-related decision-making with the help of AI tools and considering VUCA conditions

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The process of making decisions on sustainable development is the logical next step in both the concept of sustainability and sustainable development. This assertion is supported by an increasing number of research studies. In our paper which is going to be presented at this conference, analyses of previous publications, as well as the databases of prominent academics and research themes, are performed with the use of bibliometric and network analytics. The use of AI has become more common in business. The studies and white papers that prominent consultancies and technology groups have produced are the sources of this enthusiasm. The tough economic and business conditions are the root cause of the highly elevated expectations. As a direct result of this, research into the strategic uses of AI to gain a competitive advantage is being more developed. This presentation is based on the paper we wrote titled "Using artificial intelligence to make sustainable development decisions considering VUCA1: a systematic literature review and bibliometric analysis." The paper investigated the relationship between AI, VUCA, and the process of making decisions regarding sustainable development. In addition, bibliometric and content analyses are used to analyse the literature pertaining to the combined issues to integrate the findings and progress the state. This in-depth bibliometric study and literature evaluation maps articles from a variety of journals, institutions, authors, and geographical areas. The methodological value of the literature research is increased when bibliometric analysis and network analytics are combined. New discoveries are made, as well as the identification of ongoing as well as forthcoming study issues. This research on sustainable development ought to interest academics from a wide variety of subjects. They are required to use AI to uncover creative academic themes associated with decision-making in VUCA environments about sustainable development. China, Iran, and the United States are the three locations that are responsible for publishing the most notable or referred research publications.

Research methodology: we use a systematic Literature review with Quantitative methods. Our database was from Scopus with the help of Gephi, R, and VOSviewer software to analyse and visualize the outcomes.

Design, preparation and characterization of a novel Polythioehter/MWCNT Nanocomposites: From synthesis to performance

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The increasing attention to the elastomers has boosted the research works on modifying their properties. Among the studies in the field of elastomers synthesis and their mechanical and thermal properties, a limited amount of information can be found on polythioethers as one of the sulfur-containing polymers. Polythioether is an elastomer with proper thermal resistance and elongation at break, which can be used in various high-temperature and high-pressure sealing applications. This research is aimed to determine the suitable thiol/vinyl ratio and the branching agent content to synthesize a novel polythioether and the polythioether/ multiwall carbon nanotube (MWCNT) composite using two monomers, including dimercapto dioxaoctane (DMDO) and triethylene glycol divinylether. For each synthesis process, the gel permeation chromatography (GPC) was used to measure the molecular weight and the polydispersity index of the polymer chains. Fourier transforms infrared spectroscopy and Nuclear Magnetic Resonance were used to study the bond formation, while the glass transition of the polymer was evaluated by differential scanning calorimetry. Tensile and lap adhesion tests were also used to assess the mechanical properties of the samples. Field emission scanning electron microscopy was utilized to observe the dispersion of nanoparticles in polythioether/MWCNT nanocomposite. GPC results showed that the thiol/vinyl ratio of 0.5 and branching agent molar ratio of 0.2 (relative to vinyl monomer) led to the most suitable average molecular weight (2022 g/mol) which had the highest mechanical properties. The nanocomposite containing 1 wt% MWCNT, showed the highest tensile strength and elongation at break up to 2.12 MPa and 303%, respectively. A considerable increase of 30°C is obtained in maximum degradation temperature of the produced nanocomposite compared to neat polythioether.

Nano-bio selenium synthesized by bacillus subtilis modulates broiler performance, intestinal morphology and microbiota, and expression of tight junction's proteins

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A green and eco-friendly bio-based synthesis of nano selenium particles was performed using the Bacillus subtilis and the products were characterized by field FESEM, DLS and TEM methods. Dietary treatments included a control diet non supplemented with selenium and control diet supplemented with different sources of selenium (sodium selenite, organic Se, and nano-bio-Se), resulting in a total of 4 treatments with 6 replicates of 10 chicks. Broilers were assessed for performance measures, ileum morphometry, and microbial population and jejunum tight junction proteins' relative expression. The particle size of the synthesized selenium nanoparticles ranges 40 to 150 nm, with crystalline spherical shape. Inclusion of selenium increased body weight (BW) and improved FCR compared to the control diet ($P < 0.05$). Among the selenium sources, the highest BW were achieved in chicks fed sodium selenite or nano-bio–Se. Selenium supplementation meaningfully ($P < -0.01$) changed ileum morphology and reduced ileum microbiota. Inclusion of selenium increased the relative weight of the carcass, breast, and thigh and reduced the relative weight of the liver and bursa of Fabricius on day 42 ($P < 0.01$). The relative length of duodenum, jejunum, and ileum were increased on day 14 but reduced on day 42 by inclusion of selenium ($P < 0.05$). Supplementation of selenium increased ($P < 0.01$) the expression of claudin-1, occludin, and zonula occluden-1 and reduced ($P < 0.01$) the expression of claudin-5 and zonula occluden-2 on day 28. Inclusion of nano-bio selenium increased ($P < 0.05$) the expression of occludin, zonula occluden-1, and zonula occluden-2 and reduced ($P < 0.05$) the expression of claudin-5 compared to the organic selenium and sodium selenite on day 42. In conclusion, this data suggests feasibility of the biosynthesis of selenium nanoparticles by Bacillus subtilis. Additionally, the data reported herein demonstrate that nano-bio selenium can effectively improve performance and intestinal integrity compared to the common organic and inorganic sources of selenium.

Systematic study of cooperative interplay between single-electron pnicogen bond and halogen bond

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Radicals are considered to be extremely important in combustion, atmospheric chemistry, polymerization, plasma chemistry, biochemistry, and many other chemical processes. Therefore, theoretical investigation on noncovalent single-electron interactions helps us to gain a deeper insight in chemistry of reactions involving radicals. Noncovalent single-electron interaction can occur between the unpaired electron of a radical and the regions of positive electrostatic potential (positive σ -holes) which can form when an atom of Groups VII–IV participates in a covalent sigma bond. These interactions were named as single-electron halogen bonding, single-electron chalcogen bonding, single-electron pnicogen bonding and single-electron tetrel bonding for covalently bonded atoms of Groups VII–IV, respectively. Systematic study of the interaction and cooperative effect between single-electron pnicogen bond and halogen bond in X_3C•••PH_2Y•••ClY (X = H, CH_3; Y = CN, NC) sets, in two different stable configurations and at the UMP2 / aug-cc-pVTZ computational level showed that the cooperative effects for more stable structure (a) are much greater than for structure (b). It was noteworthy that the effect of halogen bond on single-electron pnicogen bond in two configurations (a) and (b) which was obtained by comparing the difference values of CX_3 •••PH2Y distance in binary and ternary sets, is different. These data showed that in structure (a), where the length of single-electron pnicogen bond is shorter and the bond strength is higher, the effect of halogen bond is less than that of structure (b). In configuration (b), as expected, the most stable structure was $C(CH_3)_3$•••PH_2NC•••ClNC, While in configuration (a) the structures with radical $C(CH_3)_3$ did not have the expected stability compared to the structures with methyl radical and the reason is related to the strain energy (Es) which can be taken as a measure of the degree of strain that drives the distortion of the ternary system and in configuration (a) due to the much smaller distance of monomers has very high values compared to configuration (b). The results of this study are useful for the applications in molecular recognition and supermolecular chemistry involving single-electron pnicogen bonds.

A novel approach to fairness-aware energy efficiency in green heterogeneous cellular networks

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Heterogeneous cellular networks are a viable solution in response to the growing demand for broadband services in the new-generation wireless networks. The dense deployment of small cell networks is a key feature of next-generation heterogeneous networks aimed at providing the necessary capacity increase. However, the approach to apply green networks is very important especially in the downlink because uncontrolled deployment of too many small-cells may increase operational costs and emit more carbon dioxide. In addition, given the novel services and resource limitation of the user layer, energy efficiency and fairness assurance are critical issues in the uplink. Considering the uplink fairness criterion, this paper proposes a dynamic optimization model which maximizes the total uplink/downlink energy efficiency in addition to providing the essential coverage and capacity of heterogeneous cellular networks. Based on the non-convex characteristics of the energy efficiency maximization model, the mathematical model can be formulated to two subproblems, i.e., resource optimization and user association. So that, a subgradient method is applied for fair resource management and also successive convex approximation and dual decomposition methods are adopted to solve the proportional fairness problem. The simulation results exhibit considerable throughput increase by 30% and 22% on average for random and hotspot user distributions, respectively. It also proved that the proposed approach managed to significantly improve the total network energy efficiency by up to 35%.

A survey of attack detection approaches in collaborative filtering recommender systems

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Nowadays, due to the increasing amount of data, the use of recommender systems has increased. Therefore, the quality of the recommendations for the users of these systems is very important. One of the recommender systems models is collaborative filtering (CF) which uses the ratings given by the users to the items. But many of these ratings may be noisy or inaccurate so they reduce the quality of the recommendations. Sometimes users, using fake profiles, try to change the recommendations in their favour. Since satisfaction and trust in such systems are very important and useful, it would be better to find a way to identify these types of users. Despite numerous studies on CF recommender systems, the design of a robust recommender system is still a challenging problem. In this paper, we have analysed the 25 previous samples of research on collaborative filtering recommender system (CFRS) for attack detection from 2009 to 2019. Most of these papers focus mainly on movie recommendations. According to these analyses, we have categorized attack detection methods on CFRS in four categories: clustering, classifying, feature extraction and probabilistic approaches. The evaluation measures, the dataset, and attacks features used in the attack detection approaches are discussed.

Collagen/PGA-incorporated bioactive glass nanoparticles as scaffold for bone tissue engineering

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Bioglass incorporation improves the mechanical strength and biological activity of bone engineering scaffold constructs. We aimed to prepare and characterize scaffolds with functional and mechanical properties suitable for bone regeneration. Porous scaffolds containing collagen-poly glycolic acid blends and various quantities of bioactive glass (BG) 45S5 were fabricated. Scaffolds with different compositions (BG/collagen-PGA ratios (w/w): 0/100; 40/60; 70/30) were characterized for their morphological properties, bioactivity, and mechanical behaviour. Then, biocompatibility and osteogenic differentiation potential of the scaffolds were analyzed by seeding mesenchymal stem cells (MSCs). Scaffolds made with collagen-PGA combined with the BG (45S5) were found to have interconnected pores (average pore diameter size 75 to 115 μm) depending on the percentage of the BG added. Simulated body fluid soaking experiments indicated the stability of scaffolds in SBF regardless of their compositions, while the scaffolds retained their highly interconnected structure. The elastic moduli of the BG/collagen-PGA 40/60 and 70/30 scaffolds were 4.1± 0.5 MPa and 4.1 ± 0.6 MPa respectively, indicating improved mechanical characteristics of the composite scaffolds in comparison to the control BG/collagen-PGA (0/100). Cell viability experiments indicated that MSCs were distributed homogeneously in all types of the scaffolds. These scaffolds did not modify metabolic activity of the cells up to 72 h. Staining with alizarin red confirmed the MSCs differentiation to osteoblasts. ALP activity increased in BG containing collagen-PGA sponge compared

to the collagen-PGA sponge without the BG. These results suggest that BG incorporation enhanced the physical stability of our collagen-PGA scaffold previously reported. This new scaffold composition provides a promising platform to be used as a non-toxic scaffold for bone regeneration and tissue engineering.

Inequality in the distribution of Covid-19 vaccine: A systematic review

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Background: The equality in the distribution of vaccines between and within countries along with follow sanitation tips and observe social distance, are effective strategies to rid the world of COVID-19 pandemic. Inequality in the distribution of COVID-19 vaccine, in addition to causing inequity to the population health, has a significant impact on the process of economic recovery.

Methods: All published original papers on the inequality of Covid-19 vaccine distribution and the factors affecting it were searched in PubMed, Web of Science, Scopus and ProQuest databases between December 2020 to 30 May 2022. Selection of articles, extraction of their data and qualitative assessment (by STROBE) were performed by two researchers separately. Data graphing form was used to extract detailed data from each study and then, the collected data were classified.

Results: A total of 4623 articles were evaluated. After removing duplicates and screening the title, abstract and full text of articles, 22 articles were selected and entered into the study. Fifteen (68.17%) studies were conducted in the United States, three (13.64%) in Europe, three (13.64%) in Asia and one (6.66%) in Oceania. Factors affecting the inequality in the distribution of COVID-19 vaccine were classified into macro and micro levels determinants.

Conclusion: Macro determinants of inequality in the Covid-19 vaccine distribution were consisted of economic (stability and country's economic status, Gross Domestic Product (GDP) per capita, financial support and human development index), infrastructure and health system (appropriate information system, functional cold chains in vaccine transport, transport infrastructure, medical and non-medical facilities per capita, healthcare access and quality), legal and politics (vaccination allocation rules, health policies, political ideology and racial bias), and epidemiologic and demographic factors (Covid-19 incidence and deaths rate, life expectancy, vulnerability to Covid-19, working in medical setting, comorbidities, social

vulnerability, incarceration and education index). Moreover, micro/ individual level factors were included in economic (household's income, home ownership, employment, poverty, access to healthy food and residency in the deprived areas) and demographic and social characteristics (sex, age, race, ethnic, religion, disability, location (urban/rural) and insurance coverage).

Size dependent and instability analysis of dual-axis micro-scanner considering damping and casimir effect under electromagnetic actuation

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The objective of this work is to create an analytical framework to study the problem of instability and squeezed film damping in bi-axial micro-scanners under electromagnetic actuation considering Casimir effects and size dependence, simultaneously. Also, the concept of Eulerian angles has also been used to achieve this idea. The novelty of this work is analytical solution of squeeze film damping considering changes of pressure distribution for micro-mirror in the horizontal and vertical rotations. Moreover, the modified couple stress theory is employed to assess the effect of the small-scale on the dynamic instability of a biaxial micro-scanner, and the governing equations are derived based on the concept of Eulerian angles. This study addresses the nonlinear effect of air squeeze film damping on the stability of the micro-scanner according to its geometry. Then, the influence of magnetic field, Casimir force, and size are examined, followed by the generation of phase portrait and plot of parametric analysis. Based on the obtained results, the Casimir force accounts for the instability threshold of the system. Moreover, the phase portrait diagrams indicates that small size and air squeeze film damping improves the rotational stability of the micro-scanner. AC voltage is applied to induce electromagnetic actuation, and the graphs of nonlinear frequency response are plotted versus the micromirror rotation amplitudes considering various effects of magnetic field actuation and air squeeze film damping. Furthermore, increasing the magnetic field diminishes the instability threshold, and augmentation of the air squeeze film damping enhances the system stability and decreases the maximum rotation amplitude of the micro-scanner. The obtained results are validated against the empirical/theoretical results in the literature.

Fabrication and characterization of polycaprolacton/ gelatin/ chitosan scaffold by dual electrospinning method

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Cardiovascular disease is one of the most common causes of death in the world, mainly caused by stenosis or blood vessels obstruction. The most common cure is using vascular grafts for long-term function. In the present study, a novel design for the manufacture of polycaprolactone (PCL)/gelatin (GEL)-chitosan (CS) scaffolds was proposed to enhance performance in vascular tissue engineering. PCL is a synthetic polymer which grants proper mechanical properties to the scaffold, whereas, GEL and CS which are natural polymers provide appropriate cell stimulation and proliferation. In this regard, the effect of electrospinning parameters on the morphology and diameter of individual PCL and GEL fibers was studied and the optimum conditions to achieve fibers with the lowest diameter was determined. Since pure chitosan cannot be electrospun, it was first blended with GEL. SEM images showed that introducing CS to GEL has decreased the fibers mean diameter to 830 nm. According to the obtained results, uniform GEL:CS fibers were achieved at 90:10 weight ratio. The optimized fibers were further used to prepare PCL/GEL-CS triple composites with different PCL contents (90, 80, 70, 60 wt%). The prepared samples were crosslinked by being exposed to the vapor of 25wt% glutaraldehyde solution. FTIR analysis was used to assess the bond structure of samples. The mechanical properties of the prepared composites were studied through tensile tests. According to the obtained results, the strength of the composites was decreased after being cross-linked, while their flexibility was increased. The wettability of the composites was determined using water contact angle test and revealed the hydrophiliciy of scaffolds. It was further confirmed found that the presence of GEL-CS has improved the wettability of the scaffolds. The degradation temperature of scaffolds was increased with PCL content as confirmed by TGA results. Finally, biodegradability test showed structural degradation of the samples.

Simulation of a crossflow ultrafiltration PSF-PVP membrane separation using finite element analysis to separate oil-water emulsion

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Our study was designed to simulate the separation of oil and water emulsions using a crossflow ultrafiltration PSF-PVP membrane. The phase inversion method was used to produce the membrane, which consisted of a polysulfone (PSF) polymer base, a polyvinylpyrrolidone (PVP) additive, and a dimethylformamide (DMF) solvent. The oil phase included soybean oil at a constant concentration of 400 ppm in a liter of bi-distilled water. Experiments assessed the permeate flux and rejection variations over about 480 minutes. The data were analyzed to validate the model's predictions. The process of membrane fouling was identified using a modified Hermia model. When experimental data is compared to Hermia's model, it is evident that fouling completely follows the complete blocking model. Hermia's modified model for complete blocking filtration in terms of time was used to simulate permeation and rejection variations. A complete pore-blocking resistance model was used to connect the rejection, feed, and permeate fluxes. Model estimates for transient permeate flux and rejection in turbulent flow regimes agree with experimental observations. Finally, a time-step and mesh-independent model for modeling the connection between flow rate and filtering time in an oil-water UF system has been developed. The modeling results show that increasing transmembrane pressure (TMP) and temperature improve permeate flux. However, TMP lowers oil rejection while increasing temperature increases oil rejection. Additionally, TMP accelerates the fouling of membranes. Additionally, a simple estimate of permeation using the average inlet-outlet pressures in the well-known Darcy equation corresponded well with the CFD results.

Network traffic classification using deep learning networks and bayesian data fusion

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The rapid growth of current computer networks and their applications has made network traffic classification more important. Many researches have been done in this field that led to different approaches. The newest approach in this field is deep learning, which can solve the suitable feature extraction as a main problem of previous approaches. However, the problem of deep learning is the need for large training data. On the other hand, due to the fact that there may not be a lot of data for different types of traffic in the network or that the information is incomplete, which will affect the accuracy of the classification. In this regard, one of the appropriate solutions to solve this challenge is the use of data fusion methods in decision level fusion. Data fusion techniques make possible to achieve better results by combining classifiers. In this paper, the first network traffic classification system is based on deep learning and data fusion techniques is presented. The proposed method can identify encrypted traffic and also distinguish between VPN and non-VPN network traffic. In the proposed approach, first a pre-processing on the dataset is performed, then three deep learning networks namely, Convolution Neural Network (CNN), Deep Belief Network (DBN), and Multilayer Perceptron (MLP) to classify network traffic is employed. Finally, the results of all three classifiers are combined using Bayesian decision fusion. To the best of our knowledge, our proposed method outperforms on ISCX VPN-nonVPN dataset. Experimental results show that the proposed data fusion method improved the classification accuracy and perform well on the different types of network traffic. The average accuracy of the proposed method is 97%.

High-temperature structural stability of intercalated cerium superhydride into graphene at low pressures

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In our previous work we computed the free energy of valence electrons of a system containing C_eH_9 doped molecules intercalated into two graphene layers by LOCV method. The novelty of that work is observing a second-order phase transition for valence electrons to form a new structural stability state at Tc = 186.3 K without applying external pressures. This transition temperature is approximately 53 K greater than the cuprate materials (the highest temperature superconductors at low pressures). This distribution of C_eH_9 molecules was just a starting point, while the main purpose of the present work is to maximize Tc with respect to different distributions of C_eH_9 molecules. For this purpose, we consider 9900 different kinds of distributions and compute their corresponding Tcs. The highest critical temperature is Tc = 198.61 K which is about 12 K greater than our previous work. It should be noted that there is no external pressure on the system and the extremely low critical pressure of the system (Pc = 2.11 K.A$^{\circ\,-3}$) is due to the interactions of fluid electrons with the environment. We also calculate the specific heat and magnetic susceptibility of the valence electrons in adjacency of the critical point. The power law behavior of specific heat demonstrates a second-order phase transition. Furthermore, at $T \leq T_c$, the magnetic susceptibility falls into ≃-1 suddenly. According to this large diamagnetism and the second-order phase transition, we guess that this structural stability of fluid electrons indicates a superconductivity phase. The main reasons of occurring this phase transition are the hydrogen-rich property of C_eH_9 molecules and the strong electron-phonon coupling created by hydrogen phonon modes. It would be interesting to consider other transition metals instead of cerium for finding higher critical temperatures in future researches. Since these metals are able to form superhydrides at high temperatures.

Effect of magnetic field of conductor with current on vibrations of magneto-elastic plate Structures

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The aim of this study was to investigate the vibration behavior of soft magnetoelastic plates mounted close to rectangular conductors conducting current which is applicable in structures. New relationships are derived for electromagnetic interaction forces with magnetoelastic plates by taking into consideration the general form of Maxwell's equations and Lorentz forces. By using von-Kámán strain-displacement relations and Hamilton's principle, we derive the nonlinear differential equations for the plate based on classical first-order shear deformation theory. It is investigated numerically how different parameters affect the resonance features of these plates by discretizing the nonlinear equations using the Galerkin method. It has been demonstrated that the intensity of the magnetic field and electric current has a profound effect on the vibration behavior of the plates. Through these effects, energy is lost in the plate, which, as a result, results in a decrease in oscillation amplitude over time.

The effect of complexing agent on electroless Nickel Sulphamate coating on Brass alloy: Structure characteristics & corrosion behavior

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This study investigated the successful performance of acidic electroless Ni–P coatings on brass alloy from the nickel sulphamate bath. Three complexing agents (i.e., sodium acetate, acetic acid, and sodium citrate) were evaluated in a practical optimized sulphamate bath. Then, the corrosion behavior of coated samples was studied by potentiodynamic polarization (DC) and electrochemical impedance spectroscopy (EIS) methods in a 3.5 wt% NaCl solution. Moreover, the structure and chemical composition of the coated samples were characterized by X-ray diffraction (XRD) and energy dispersive spectroscopy (EDS), respectively. In addition, the morphology of the coatings was examined through scanning electron microscopy (SEM), as well as investigating properties such as thickness, grain size, and actual capacitance using computational methods. The results revealed that the structure and corrosion behavior of coatings were strongly influenced by both practical conditions and complexing agent factors. Low and medium phosphorus coatings with nanocrystalline and semi-crystalline structures were developed according to EDS and XRD results. Additionally, SEM images and electrochemical results demonstrated low phosphorous Ni–P coatings from baths containing sodium acetate with a cauliflower structure, as well as an acetic acid complexing agent with a dense structure and highly acceptable granulation which had the best anti-corrosion behavior (R_p=46,369 Ω cm^2 & i_{corr}= 0.56 μA/cm^2 and R_p=44,561 Ω cm^2 & i_{corr}= 0.7 μA/cm^2, respectively) compared to a bare sample (R_p=3687 Ω cm^2 & i_{corr}= 2.72 μA/cm^2).

Investigating the effects of environmental patents and climate change mitigation technologies on sustainable economic growth in the Middle East

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Background: Sustainable economic growth and identifying factors affecting it are among the important issues which have always received attention from researchers of different countries. Accordingly, one of the factors affecting economic growth, which has received attention from researchers in the developed countries over recent years, is the issue of environmental technologies that enter the economic cycle of other countries after being patented through technology transfer.

Methods: The current research investigated the role of the environment-related patents and the effects of the patented technological innovations compatible with climate change mitigation on the economic growth and development in the Middle East countries within a specific time period. The required data were gathered from the valid global databases, including Organization for Economic Cooperation and Development and World Bank and have been analyzed usingmulti-linear regression methods and econometric models with Eviews 10 software.

Results: The obtained results with 95% confidence level show that the environmental patents ($\beta = 0.02$) and environment management ($\beta = 0.04$) and technologies related to the climate change mitigation ($\beta = 0.02$) have a significant positive impact on the sustainable economic development and growth rate in the studied countries.

Conclusions: Such a study helps innovators and policymakers in policy decisions related to sustainable development programs from the perspective of environmentally friendly technologies by demonstrating the role of patents in three important environmental areas, namely environmental management, water-related adaptation and climate change mitigation, as one of the factors influencing sustainable economic growth.

Wastewater remediation by using semi-interpenetrating hydrogels

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Due to the population increasing, the potable water development by water recycling becomes of great necessity, additionally the rising costs for fresh and wastewater, the treatment and reuse of low-contaminated process water streams is increasingly gaining in importance. The short supply of water in many regions of the world is propelling recycling and reuse which, in turn, is increasing the demand for appropriate mechanisms, products and services. Water pollution is a major problem in the global context; the specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes such as elevated temperature and discoloration. Phenol compounds, such as phenol and nitrophenol are common contaminates in wastewater discharged by petrochemical industries, coking plant, coal processing, petroleum refining, pulp and paper manufacturing, etc. Superabsorbent hydrogels are three-dimensional crosslinked hydrophilic, linear or branched polymers with the ability to absorb large quantities of water, saline or physiological solutions compared with general absorbing materials. Because of their excellent hydrophilic properties, high swelling ratio, and biocompatibility, hydrogels have been widely used in agriculture biomedical area as antibacterial materials, tissue engineering, biosensors, and sorbents for the removal of dyes and pollutants from water/waste water. The main aim of this work is to study the swelling behavior of the semi-IPN responsive hydrogels based on PAlAm.HCl and PAAc and investigate the adsorption of nitrophenol from waste water by using these hydrogels. The swelling behavior was measured and the pH, temperature and salt sensitivities were investigated through measuring equilibrium swelling ratios in different environmental solutions. Finally, the removing of nitrophenol from water was studied by ultra violet (UV) measurements.

LPF-Defense: 3D adversarial defense based on frequency analysis

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The 3D point clouds are increasingly being used in various application including safety-critical fields. It has recently been demonstrated that deep neural networks can successfully process 3D point clouds. However, these deep networks can be misclassified via 3D adversarial attacks that are intentionality designed to perturb some point cloud's features. These misclassifications may be due to the network's overreliance on features with unnecessary information in training sets. As such, identifying the features used by deep classifiers and removing features with unnecessary information from the training data can improve network's robustness against adversarial attacks. In this paper, the low pass filtered defense framework is proposed to discard the unnecessary information from the training data by suppressing the high-frequency contents in the training phase. The conducted analysis showed that adversarial perturbations place in high-frequency contents of adversarial point clouds. Experiments showed that the proposed defense method achieves the state-of-the-art defense performance against six adversarial attacks on PointNet, PointNet++, and DGCNN models. The findings are practically supported by an expansive evaluation of synthetic (ModelNet40 and ShapeNet) and real (ScanObjectNN) datasets. In particular, improvements are achieved with an average increase of classification accuracy by 3.8% on the Drop100 attack and 4.26% on the Drop200 attack compared to the state-of-the-art methods. The method also improves the accuracy of models on the original dataset compared to other available methods.

Two partially reconfigurable architectures for efficient implementation of Convolutional Neural Networks (CNNs)

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Today, convolutional neural networks (CNN) are widely used in many applications of artificial intelligence (AI), including image processing, video processing, natural language processing, and forecasting time series. CNNs require heavy computations to provide significant accuracy for many AI tasks. Normally, the training phase of CNNs is done through GPUs. However, the inference phase, which runs on the edge devices, is executed through a dedicated hardware accelerator. Therefore, the efficient implementations of CNNs to improve performance using limited resources without accuracy reduction is a challenge for AI systems for edge devices. One of the architectures for the efficient execution of CNNs is the array-based accelerator that consists of an array of similar Processing Elements (PEs). The array accelerators are popular as high-performance architecture using the features of parallel computing and data reuse. These accelerators are optimized for a set of CNN layers, not for individual layers. Using the same accelerator dimension size to compute all CNN layers with varying shapes and sizes leads to the resource underutilization problem. To handle this challenge, two research teams under my supervision propose two solutions namely CNNX and RASHT in last few years. In my talk, I will discuss both techniques and explain how we can have a flexible and scalable architecture for array-based accelerator that increases resource utilization. The RASHT architecture resizes PEs depending on the size and shapes of the layers. The CNNX implements a small and efficient accelerator and then using retiling executes the layers with different sizes and shapes. Both architectures have been evaluated through different CNN structures such as GoogLeNet, MobileNet and AlexNet. Experimental results show the effectiveness of both proposed hardware accelerators.

Effect of substitution of Zirconium dioxide by Tin (IV) oxide on radiation shielding and properties of used in therapeutic environments

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The $Li_2O–Al_2O_3–SiO_2$ (LAS) glasses were made using the melt quenching method. In this study, by using Monte Carlo simulation and the Phy-X/PDS software program are determined for radiation shielding, structural, mechanical, and acoustic features of the LAS glass samples. The Linear Attenuation Coefficient (LAC), Half-Value Layer (HVL), Mean Free Path (MFP) and Math Attenuation Coefficient (MAC) are identified as important parameters controlling the behavior of the LAS glasses. The energies used in this study varied between 0.284 MeV and 1.173 MeV. By increasing the concentration of ZrO_2 - SnO_2, the density of the present samples increases from 2.473 to 2.501 g/cm^3.

This data helped us define the glass samples for both GEANT4 simulation and Phy-X PSD program to calculate the Liner Attenuation Coefficients (LAC) of the chosen glasses (G1-G4) at different energies. The GEANT4 and Phy-X PSD values are nearly the same for all LAC. A comparison of the Phy-X PSD program and GEANT4 simulation of the LAC values and their variation with photon. The LAC values decrease rapidly with increasing energy due to the photoelectric effect (PE) dominance in this energy region. The LAC values, from 2.84–1.173 MeV are approximately constant or decrease slowly with increasing photon energy due to Compton scattering, the most dominant process in this energy region, and its linear Z-dependence. The Liner Attenuation Coefficients values determined by GEANT4 for 2.84 and 1.173 MeV varied between 0.274 and 0.313 cm^2 /g and 0.144–0.140 cm^2/g, respectively. Therefore, the G-4’s LAC is the highest compared to other sample codes. This result indicates that more radiation is being attenuated in the glass with a high concentration of SnO_2.

Phonon mode and thermal conductivity of helix and double-helix carbon nanotubes

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There has been a high interest in carbon nanotube (CNT) fibres due to their extraordinary multi-functional properties recently. In this study, a helix and double-helix CNTs presented with a multi-twisting design that involved a combination of self-twisting and whole-twisting. Non-equilibrium molecular dynamics (NEMD) simulations were performed to calculate the thermal conductivity and phonon mode of twisting CNT fibres.

By comparing the results of self-twisting of isolated (5,5) and (10,10) CNTs with a length of 60 nm, our study showed that the torsional deformation increases the thermal conductivity of CNT. Furthermore, two parallel (5,5) CNTs with a cut-off distance of 0.34 nm were used to build CNT fibres to conduct the effect of different forms of torsional deformation on the thermal conductivity and phonon mode of CNT fibres. Our NEMD simulations showed that self-twisting and whole-twisting increased the thermal conductivity of CNT fibres, when the torsional angle increase from 0 to 360 degree. We observed that the maximum thermal conductivity can be reached by multi-twisting. The maximum value of thermal conductivity measured with an initial self-twisting of 180 degrees followed by whole-twisting of 180 degrees.

Moreover, The Fourier transform was applied to the velocity auto-correlation function of atoms to study the phonon modes of CNT fibres, and the energy spectrums of three different forms of torsion were compared. Regarding the influence of the torsional deformations on the energy spectrum, the results indicated that both in-plane (low frequency) and out-of-plane (high frequency) phonon spectra play a significant role in the thermal conductivity of CNT fibres.

Improving classification accuracy for prostate cancer using noise removal filter and deep learning technique

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Prostate Cancer (PCa) can be considered as the second cause of death among men all over the world. Different techniques based on deep learning have been proposed for accurate PCa detection using Magnetic Resonance Imaging (MRI) images. In this research work, an accurate 2d CNN-based Convolutional Neural Network (CNN) model is developed and implemented for PCa binary classification (0 for Benign and 1 for Malignant). The paper is aimed at improving the classification accuracy in two phases. The first one is to use image pre-processing algorithms such as (DICOM to jpg format, image resizing and labeling, adding noise, and noise removal by median filter). The second improvement is achieved by increasing the dataset size. The dataset of 20 patients were used which consist of 15 patients (3249 MRI slices) with cancerous tumor and 3 patients without cancer (1751 MRI slices). To evaluate the performance accuracy of the proposed approach, 30% of the dataset is used for the test and validation while 70% used for the training. The accuracy is found based on the Area under Curve (AUC) of Receiver Operating Characteristic (ROC). Test results indicate that the AUC is 0.98 without pre-processing whereas its value increased to 0.9993 with pre-processing using epoch iteration = 60 and the total dataset images.

Experimental mixing procedure for constructing particle size distribution curves of selected sediment units

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The goal of this study is to use the mixture procedure to simulate particle-size distribution curves and mimic real sedimentary units. The movement aspects, such as deposition and transport resulting sedimentary environments, is essentially pertinent to the particle size. The current study hypothesizes that reproducing sediment units that might characterize sediment types in areas that are remote and/or difficult to sample is experimentally possible.

The procedure is by employing available sediment samples named source soils that can easily approach and sample to mix, simulate, and construct the (non-available) sedimentary units named target sediment units (TSU). The particle size distribution (PSD) percentages are essentially used in the mixture procedure to reproduce the non-available (target) units (TSU).

Several sedimentary units were targeted, designed, and simulated; They include marsh, bay mud, and natural levee sediment units selected from the eastern Basra side at the lower Mesopotamian plain, southern Iraq.

The matching between particle size distribution (PSD) curves of the Simulated sediment units (SSU) and Target sediment unit (TSU) was very well and was verified by applying a developed slope proximity ratio. For the three tested sediment units (marsh, buy mud, and natural levee), the ratios of slope proximity were 1.0, 0.93, and 0.99, respectively.

For the mineralogical composition, the consistency limits were used as a proxy. The Casagrande plasticity chart was modified to reveal two empirical functions linking the plasticity indices to the clay mineral groups. The two predictions are reliable means to proxy the mineralogy of the fine-grained sediments.

MOGSABAT: A metaheuristic hybrid algorithm for solving multiobjective optimization problems

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This study proposes a novel strength of multi-objective gravitational search algorithm and bat algorithm MOGSABAT to solve multi-objective optimization problem. The proposed MOGSABAT algorithm is divided into three stages. In the first stage (moving space), a switch in a solution from single function to multiple functions that contain more than one objective to use the gravitational search algorithm GSA is determined. We established a new equation to calculate the masses of individuals in the population using the theoretical work found in the strength Pareto evolutionary algorithm. In the second stage (moving in space), how to handle the bat algorithm BAT to solve multiple functions is established. We applied the theoretical work of multi-objective particle swarm optimization into the BAT algorithm to solve multiple functions. In the third stage, multiobjective GSA and multi-objective BAT are integrated to obtain the hybrid MOGSABAT algorithm. MOGSABAT is tested by adopting a three-part evaluation methodology that (1) describes the benchmarking of the optimization problem (bi-objective and tri-objective) to evaluate the performance of the algorithm; (2) compares the performance of the algorithm with that of other intelligent computation techniques and parameter settings; and (3) evaluates the algorithm based on mean, standard deviation and Wilcoxon signed-rank test statistic of the function values. The optimization results and discussion confirm that the MOGSABAT algorithm competes well with advanced metaheuristic algorithms and conventional methods.

Static bending of functionally graded single-walled carbon nanotube conjunction with Modified couple stress theory

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Transverse deflection of functionally graded micro beams reinforced by single-walled carbon nanotubes (SWCNTs) is presented based on modified couple stress theory. The effect of shear deformations by two different beam theories, i.e., both Euler and Timoshenko beam theories are studied, to present a profound insight, it studies the effect of length material parameter ratio, material volume fraction of carbon nanotube, the SWCNT distribution types, boundary conditions, and aspect ratio (Length/thickness). Governing equations and boundary conditions is derived by using the Lagrange equations. Afterwards, to obtain the solution of differential equations is solved by the unknown displacement functions are expanded into series the simple polynomials together with the auxiliary functions for the essential boundary conditions. Some numerical results show us that the transverse deflection predicted by modified couple stress theory less value significantly from classical ones, especially for thin beams. Also, size dependency of FG-SWCNT micro beams differs from isotropic homogeneous micro beams as it is a function of power index of material distribution. We found a distribution type of FG-X SWCNT with increasing the volume fraction gives less deflection compared with FG-O SWCNT.

Magnesium based hydrogen storage materials for automobile applications: Recent advances and future challenges

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The present work is an attempt to explore on–board hydrogen storage technologies concerning magnesium based solid–state matrix for fuel cell devices to be competitive with current vehicles. Hydrogen, a potential and clean fuel, can be applied in the state–of–the–art technology of 'zero emission' automobiles. Hydrogen economy infrastructure both for stationary and mobile purposes is complicated due to its critical physicochemical properties and materials play crucial roles in every stage of hydrogen production to utilization in fuel cells in achieving high conversion efficiency, safety and robustness of the technologies involved. Moreover, traditional hydrogen storage facilities are rather complicated due to its anomalous properties such as highly porous solids and polymers have intrinsic microporosity, which is the foremost favorable characteristics of fast kinetics and reversibility, but the major drawback is the low storage capacity. In contrast, metal hydrides and complex hydrides have high hydrogen storage capacity but thermodynamically unfavorable. Therefore, hydrogen storage is a real challenge to realize 'hydrogen economy' that will solve the critical issues of humanity such as energy depletion, greenhouse emission, air pollution and ultimately climate change. Magnesium based materials; particularly, magnesium hydride (MgH_2) has been proposed as a potential hydrogen storage material due to its high gravimetric and volumetric capacity as well as environmentally benign properties to work the grand challenge out. A breakthrough in H_2 ab/desorption kinetics of MgH_2 was achieved by ball-milling with 1 mol% Mg-Nb oxides (e.g., $MgNb_2O_6$, $Mg_4Nb_2O_9$ and $Mg_3Nb_6O_{11}$). The presence of the ternary oxides remarkably increases the H_2 ab/desorption kinetics of nano-structured MgH_2, were examined by a volumetric Sievert apparatus. Desorption curves were constructed and analyzed by the Johnson-Mehl-Avrami formalism in order to derive reaction rate constants at different temperatures and corresponding activation energy was estimated by Arrhenius plot. The role of ternary Mg-Nb oxides on H_2 ab/desorption properties of MgH_2 will be discussed on the basis of kinetic model proposed in this context.

Climatic sensorless maximum power point tracking using adaptive neuro-ESC control technique applied to PV systems

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This manuscript presents a new control strategy based on the combination of an extremum seeking control (ESC) technique with a nonlinear neuro-adaptive method to achieve the Maximum Power Point Tracking (MPPT) in photovoltaic systems. In this new method, a RBF-neuro observer is used to estimate unknown PV system parameters (i.e. irradiation and temperature) and derive an optimal voltage signal. Then this signal is fed into a modified ESC to ensure a satisfactory MPPT, despite the varying atmospheric conditions. A detailed stability of the proposed combined approach is analysed using root locus theories. The effectiveness and the capability of the proposed MPPT approach are assessed, through numerical simulations using MATLAB/Simulink software, and compared to those of the modified ESC without the adaptive neuronal observer and the P&O algorithm under varying operating conditions. A real time implementation is also carried out using Arduino Mega board to demonstrate the feasibility of the proposed method.

Generalized odd inverse Rayleigh class

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Introduction: Many distributions have been developed by modifying existing distributions. The inverse Rayleigh (IR) distribution which was developed by Voda (1972) has undergone several transformations in a bid to improve its flexibility for modeling dataset. One of such extensions is the odd inverse Rayleigh (OIR) family of distributions (Hemeda and Ahsan ul Haq, 2020).

The study seeks to generalize the OIR family for developing more flexible models to cater for datasets with non-monotonic and heavy tailed failure rates.

Methodology: The GOIR class of distributions is a generalization of the OIR family. Its parameters are estimated using Maximum likelihood estimation. Kolmogorov-Smirnov test is used to determine the goodness-of-fit of a newly developed model from this class. Information criteria measures are used to select for model selection. Application of the new model is demonstrated using secondary data.

Results: The GOIR class of distributions was introduced. Four new models were proposed from this class. An investigation reveals that the GOIRW distribution can model datasets that exhibit non-monotonic failure rates as shown by plot of failure rate function. Some of its statistical properties such as the moments and order statistics among others were derived. Parameters of the new model were estimated and their performance assessed as good, using simulations. A demonstration of the usefulness of the new distribution using real data shows it provides a comparatively better fit to the data than competing models.

Conclusions: The GOIR class of distributions is introduced. It's properties such as: quantile function, moments, and the shapes of its density and hazard rate functions are investigated and established. Comparative analysis shows that the new distribution can provide better fit to some datasets than some competing models and hence should be considered especially when modeling non-monotonic datasets with heavy tails.

Mobile money transactions and banking sector performance in Ghana

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This study examines the effect of mobile money transactions on banking sector performance in Ghana using monthly data for the period 2015–2020. The data is a comprehensive database of all the licensed Banks, Savings and Loans, Leasing Companies and other bank and financial institutions obtained from the Bank of Ghana (BoG) monetary time series database. A composite index of banking sector performance was created from three indicators namely; depth, stability and efficiency of the banking sector. The Autoregressive Distributed Lag (ARDL) bounds test for cointegration and the Error Correction Model (ECM) were employed in the analysis. Also, in complementing the econometric findings, an impulse response analysis was performed. The findings revealed that mobile money transaction has a detrimental effect on banking sector performance. Thus, mobile money transaction has a negative effect on the composite index of banking sector performance. Findings from the disaggregated components indicate that mobile money transactions hurt banking sector efficiency, while its effect on banking sector depth and stability is insignificant in the long run. It is concluded that the implication varies from one indicator to another concerning the direction and magnitude of the influence. It is therefore recommended that commercial banks should have a partnership with the mobile money operators and settle on a number of services that will enable customers to simultaneously use both mobile money and banking services also, there is the need for banks to exercise much caution in their decision to consider adopting mobile money-based services when designing their business models.

Micronutrient intake inadequacy and its associated factors among lactating women in Bahir Dar city, Northwest Ethiopia, 2021

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Background: Inadequate intake of micronutrients in lactating women was prevalent worldwide. In particular, to our knowledge, there has been little report concerning Ethiopian lactating women regarding their micronutrient intake. Our objective was to assess micronutrient intake inadequacy and its associated factors among lactating women in Bahir Dar city, Northwest Ethiopia, 2021

Methods: Community-based cross-sectional study was conducted from February 15 to March 05, 2021. Four hundred thirteen respondents were selected through systematic random sampling. Data were collected by interviewer-administered semi-structured questionnaire and a single multiphasic 24 hours dietary recall was used to assess dietary assessment. Data entry and analysis were carried out using EpiData and SPSS respectively. The ESHA food processor, Ethiopian food composition table, and world food composition table have used the calculation of nutrient values of the selected micronutrient. The nutrient intakes were assessed by Nutrient Adequacy Ratio (NAR) and Mean Adequacy Ratio (MAR). Multivariable binary logistic regression analysis was done to identify the factors of overall micronutrient intake inadequacy.

Result: The overall prevalence of micronutrient intake inadequacy across 12 nutrients was 39.9 % [95% CI (34.9, 45.0)]. The inadequate intake of vitamin A was 98.2%. Similarly, the inadequate intake of B vitamins ranges from 13.4% to 68.5%. The insufficient intakes of calcium, iron, and zinc were 70.9%, 0%, and 4.7%, respectively. Around 36 and 91.6% of the respondents had inadequate intake of selenium and sodium, respectively. On multivariable logistic regression analysis; Being divorced was 2.7 times more likely to have overall micronutrient intake inadequacy than being

married [AOR= 2.71, 95% CI (1.01, 7.33)]. The odds of overall micronutrient intake inadequacy were 2.6 higher in merchants than in housewives [AOR= 2.63, 95% CI (1.40, 4.93)]. Lactating women who had poor nutritional knowledge were 2.7 times more likely to have overall micronutrient intake inadequacy than those who had good nutritional knowledge [AOR=2.71, 95% CI (1.47, 4.99)].

Conclusion and Recommendation: Overall, the micronutrient intake in lactating women was lower than the recommended levels. Therefore; educating lactating women about appropriate dietary intake is essential.

Synthesis and characterization of semi-interpenetrating polymer network hydrogel based on polyacrylic acid/polyallylamine and its application in wastewater remediation

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This study was an attempt to synthesize novel semi-IPN Hydrogels of Poly(acrylic acid) (PAAc)-Poly(allylamine) (PAlAm) and PAAc-poly(allylamine hydrochloride) (PAH) with different molar ratio of components. The influence of pH, time, temperature and salinity of water, as well as cross-linker amount, were also investigated. The synthesized PAAc/PAlAm and PAAc/PAH hydrogels were characterized using Fourier Transform Infrared Spectroscopy. The swelling behavior of the semi-IPN hydrogels revealed that the maximum swelling ratio was obtained for the sample SAPH1 with a PAAc/PAH ratio of 1/0.25 and for the sample SAP3 with a PAAc/PAlAm ratio of 1/1. Moreover, for the PAAc/PAH system, the maximum swelling degree was observed in alkaline pH, while for PAAc/PAlAm system, the maximum swelling was shown in pH = 7. The swelling study of the hydrogels in the aqueous solution of NaCl showed that increasing the salt concentration caused the limitation of water absorption. It was also shown that the increase in temperature of the swelling process led to an enhancement of the swelling ratio in distilled water. According to the results, the optimum amount of cross-linker was found for achieving the maximum swelling degree. UV–Vis spectroscopy was employed to determine the dynamic change of the 4-nitrophenol concentration. The results revealed the complete absorption of the 4-nitrophenol pollutant. This suggests that the prepared semi-IPN hydrogel is an appropriate system for treating the wastewater.

Ultrahigh reversible hydrogen storage in K and Ca decorated 4-6-8 biphenylene sheet

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By applying density functional theory (DFT) and ab-initio molecular dynamics (AIMD) simulations, we predict the ultrahigh hydrogen storage capacity of K and Ca decorated single-layer biphenylene sheet (BPS). We have kept various alkali and alkali-earth metals, including Na, Be, Mg, K, Ca, at different sites of BPS and found that K and Ca atoms prefer to bind individually on the BPS instead of forming clusters. It was found that 2X2X1 supercell of biphenylene sheet can adsorb eight K, or eight Ca atoms, and each K or Ca atom can adsorb 5H_2, leading to 11.90% or 11.63% of hydrogen uptake, respectively, which is significantly higher than the DOE-US demands of 6.5%. The average adsorption energy of H_2 for K and Ca decorated BPS is −0.24 eV and −0.33 eV, respectively, in the suitable range for reversible H_2 storage. Hydrogen molecules get polarized in the vicinity of ionized metal atoms hence get attached to the metal atoms through electrostatic and van der Waals interactions. We have estimated the desorption temperatures of H_2 and found that the adsorbed H_2 can be utilized for reversible use. We have found that a sufficient energy barrier of 2.52 eV exists for the movement of Ca atoms, calculated using the climbing-image nudged elastic band (CI-NEB) method. This energy barrier can prevent the clustering issue of Ca atoms. The solidity of K and Ca decorated BPS structures were investigated using AIMD simulations.

A novel optimization of fractional order pid controller using chaotic maps based atomic search optimization for pH control in continuous stirred tank reactor

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Usage of Continuous Stirred Tank Reactor (CSTR) in any chemical process is inevitable, proper control and tuning of pH in a CSTR is a requirement. To achieve this Fractional Order Proportional Integral Derivative (FOPID) controller integrated with physics-inspired heuristic optimization algorithm Atomic Search Optimization (ASO) and Chaotic Atomic Search Optimization (Ch ASO) is proposed. The FOPID controller is an inclusive version of the classical Integer Order Proportional Integral Derivative (IOPID) controller. The main advantage of the FOPID is the availability of the tunable parameters λ, μ in addition to the Kp, Ki, Kd of the classical PID. To obtain the optimal values of the tunable parameters for the pH control of CSTR the ASO and Ch ASO are used. The first work is to improve the convergence speed and to avoid the local optimum stagnation of ASO by using the novel Ch ASO proposed. This uses three different chaotic maps such as Tent, Circle and Logistic maps for the betterment of the quality of initial population in ASO. The proposed Ch ASO was applied to four standard benchmark functions and compared to the ASO using Random Number Generators (RNG). The statistical performance of proposed Ch ASO and ASO were studied. The objective functions (OF) used for this optimization are the Integral Time Absolute Error (ITAE), and Zwe-Lee Gaing's (ZLG).From the results obtained usage of the chaotic maps for initialization of atom population improved the convergence properties of the ASO. The second work is to simulate the ASO-FOPID and Ch ASO- FOPID using the mentioned objective functions and compare it with the ASO-IOPID and Ch ASO-IOPID for the pH control of CSTR. The transient response analysis, frequency response analysis and robustness analysis was carried out for obtaining the best algorithm-controller combination. From the simulation results, the Ch ASO-FOPID performed better with ITAE as the objective function.

Investigation of the influence of various deposition parameters on the thin film morphology

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Sputter deposition is a complex process; it is obvious that the energy and direction of the particles arriving at the substrate is in close relation with the transport process from the target to the substrate, it is desirable to model this transport of atoms through the background gas. The quality of thin films is the key to any improvement made in the manufacturing of device components. Therefore, the method of obtaining this quality based on the deposition parameters is the focus of our group. The influence of temperature and high pressure on the number of ejected particles, and therefore their deposition and formation of the finest thin films, is investigated in this paper using the sputtering technique in the context of the Monte-Carlo approximation. First, a vacuum chamber with a dimension of 30x30x50 cm, holding a magnetron with a circular target with a radius of 2 cm, was created. Then, inside this chamber, 105 particles of argon (Ar) were followed by the same amount of xenon (Xe) gas we injected. This target moves 8 cm away from the substrate (with a radius of 7 cm), containing three materials (silicon (Si), germanium (Ge), and copper (Cu)) widely used in advanced technologies such as electronics and photovoltaic cell panels. The obtained results demonstrate that increasing the pressure (0.5, 2, and 5 Pa) for both gases dropped off spectacularly the total number (with different values) of the material particles reaching the substrate and disrupting the morphology of the thin films. Moreover, in contrast to pressure, it has also been proven that mounting gas temperatures of 100, 300, and 600 K, representing three different states in Kelvin degrees, where 100 K→-173°C for the low (cold), 300 K→27°C for the regular (atmospheric), and 600 K→327°C for the high (warm) instances, supply a large number of material atoms at the substrate level. In addition, silicon yielded the best results compared to germanium and copper.

Modeling multi-section continuum robots using meta-heuristics approaches

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In this study, Particle Swarm Optimization (PSO) is used to solve the Inverse Kinematic Model (IKM) of multi-section continuum robots, which is a challenging problem due to the highly nonlinear nature of its motion equations. The structure of the continuum robots is described and the PSO algorithm is applied to determine the IKM. The accuracy of the solution is verified through the forward kinematic model, using specific parameters for cognitive factors and inertia weight. The optimal angles found using PSO result in a very accurate end-effector position. The performance of PSO is compared to other meta-heuristic approaches through simulations in Matlab, showing that PSO provides a balance between accuracy and efficiency. The results suggest that PSO is a suitable approach for solving the IKM of continuum robots with complex structures.

Synthesis techniques, characterization and mechanical properties of naturally derived hydroxyapatite scaffolds for bone implants: A review

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Hydroxyapatite (HAp) with good mechanical properties is a promising material meant for several useful offers in dentistry and orthopedics for biomedical engineering applications for drug delivery, bone defect fillers, bone cement, etc. In this paper, a comprehensive review has been done, by reviewing different literature related to synthesis techniques, mechanical properties, property evaluation, method of calcination, and characterization of hydroxyapatite derived from catfish and bovine bones. Other sources like algae, shells, and other animal bones. The discussion is about the requisite features vital to attain the best properties for the envisioned bid of bone graft. The authors examined the methods for producing the necessary microstructure as well as those for improving the mechanical properties of naturally derived HAp. The standard values for tensile strength were found to be within the range of 40–300 MPa, compressive strength was 400–900 MPa, Elastic modulus was 80–120 GPa, and fracture toughness was 0.6–1 MPa $m^{1/2}$ (Ramesh et al., 2018; Landi et al., 2000). Also, the porosity range was 70–85% (Yang et al., 2010), the density is 3.16 g/cm^3 and the relative density is 95–99.5% (Ramesh et al. 2018; Landi et al. 2000). The literature revealed that the CaP ratio varies about the source and sintering temperature. For example, for bovine bone, a CaP ratio of 1.7 (Mezahi et al. 2009) and 1.65 (Barakat et al., 2009) was obtained at 1100 °C and 750 °C respectively. A basic understanding of the effect of adding foreign material as a strengthening agent to the mechanical properties of HAp is a ground factor for the development of new biomaterial (Natural hydroxyapatite, NHAp). Therefore, it is inferred that upon a careful combination of main parameters such as compaction pressures, sintering temperatures, and sintering dwell times for the production of NHAp, mechanical properties can be enhanced.

Magnetic and resistivity investigation of geologic structures in the basement complex of Aran-orin, Kwara-State, Nigeria

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This study aims at integration of magnetic and vertical electrical sounding (VES) resistivity methods to determine groundwater prospective in part of Aran-orin Sheet 224. A total of three traverses were established in the study area for the vertical electrical sounding using the Schlumberger electrode configuration. A total of 17 VES points was established using the ABEM Terrameter SAS 1000C model with maximum half-current electrode spacing (AB/2) of 120m. A total of eight traverses were established for the magnetics survey with station intervals of 10 m and inter-profile spacing of 100 m. The magnetic and VES data were qualitatively and quantitatively interpreted using IPI2WIN and OASIS MONTAJ package respectively. The geo-electric sections reveal a maximum of 3-4 layers beneath the sub-surface an overburden thickness ranges from 8.2 m to 64.9 m and the corresponding lithology inferred are topsoil, weathered Rock, fractured basement and fresh basement. The depth to basement using half-width method showed that the depth ranges from 8.4-56.04 m, which corresponds with the electrical survey.

Purpose of ICT use by extension practitioners for agricultural extension service delivery in Southwestern Nigeria

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The study investigated information and communication technologies use for specified extension delivery purposes among practitioners in southwestern Nigeria. A pre-tested structured questionnaires along with in-depth interview schedule was conducted to collect data from senior officials who served as key informants from organizations. Data was analyzed using descriptive (frequency and percentages and mean). A three-stage sampling procedure was used to select respondents from Oyo, Ondo, Ekiti and Ogun States, being purposively selected due to presence of notable Public Extension Organizations (PEO) and Non-Public Extension Organizations (NPEO) in them. A total number of 165 respondents were selected from NPEO (41) and PEO (124) organizations. Purpose to which each tool was used for include information gathering purpose (52.40%, documentation (51.60%) and dissemination purpose (50.00%) for respondents from public organizations; while these were significantly higher for respondents from non-public organizations (68.30%), (75.60%) and (70.70%) respectively. Findings revealed that practitioners from public organizations utilized ICTs most for information gathering purpose while those from non-public organizations utilized ICTs most for documentation purpose. This emphasizes the conventional information flow that starts from the researchers to extension and finally to farmers. This equally explains that extension practitioners' limits their use of ICTs to the level of the farmers for substantial information exchange between the duo.

Undergraduate students' predilection for seating arrangements and their engagement in a collaboration learning in SED482 blended learning instruction classroom

Nja, Cecilia Obi, Erim, Costly, Ukah, Julius Ukah, Idiege, Kimson Joseph, Eneyo, Eyo and **Uwe, Uduak Edet**
University of Calabar, Nigeria

This paper examined how the predilection of undergraduate students' seating arrangements impacted on their collaboration learning in SED482 blended learning classroom. This study was conducted in the department of science education university of Calabar, Nigeria. The sample of this study was 120 fourth year chemistry education students. This research employed a mixed method design by using qualitative and quantitative studies. Two questionnaires were constructed and used in this study named: Seating arrangement choice and students' outcomes (SACASO). This instrument was validated and reliability conducted. The Cronbach alpha reliability ranged from 0.89 to 0.91. Two research questions were used in this study: (1) When students engaging in collaboration learning activities in SED482 in blended instruction classrooms in the university, what are their classroom experiences in U-shape seating arrangement and traditional arrangement. (2) Between U-shape and traditional seating arrangement, which is students' choice? In which way does students' predilection influence their engagement in classroom instruction practices in SED482 blended instruction classrooms in the university? The data collected was analysed using a two-way analysis of variance (ANOVA). Results obtained showed that in a U-shape seating arrangement, students excelled more than students who sat in a rows-and-columns seating arrangement with regard to communication proficiency, concentration

stability, and learning environment. Wilcoxon signed-rank analysis test showed students preferring the U-shape seating arrangement type. Learners have chosen the U-shape seating arrangement prior and after they were introduced to it. Their preference was due to the fact classroom practices were enhanced. The paper also discussed the implications of U-shape seating arrangement for effective blended learning in classroom instruction.

Functionalized biopolymeric nanocomposite materials: A platform for interactive metal nanoparticles for cutting-edge applications

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The feasibility of functionalizing bio-inspired polymeric materials with desirable cross linking agents is expected to find wide application in future metal-biocomposite device fabrication due to shift from the use of synthetic polymer as a stabilizer in nanocomposite to non-toxic biopolymeric material. Typically, our group has been involved in the study of chitosan with improved binding properties as a support for metal nanoparticles synthesized via facile system-induced method. Functionalized biopolymeric composites including chitosan-pyridinedicarboxylic acid/nickel(II), cobalt(II), iron(III); chitosan-2,7-naphthalenediol/ZnO and chitosan-ascorbic acid/bismuth(II) nanocomposites were prepared by reacting chitosan and corresponding ligand molecules in the presence of metal salts/oxides. Various nanosizing techniques ranging from chemical reduction to heat treatment of calcining of the precipitated product at elevated temperature were employed to obtain a nanocomposite with uniform nanoscale morphology and large pore size distribution. The polymerization testing indicated that these bionanocomposites exhibited enhanced catalytic performance, excellent chemosensoring performance among other applications. Largely, the enhanced performances are attributable to uniform nanoparticles structure, large pore size distribution and stabilization effect of the chitosan mixed ligands, which prevented agglomeration and accelerated the adsorption of reactant molecules. The resulting performances led to a better understanding of designing and using such metal bionanocomposites for a number of applications such as catalysis, chemo sensors, agropesticides etc.

Effect of groundnut shell ash in concrete produced using bida natural aggregates

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In this research, the effect of utilizing Groundnut shell ash in the production of concrete utilizing locally sourced natural coarse aggregate from Bida Niger state, Nigeria Environs was investigated. A mix ratio of 1:2:4 was utilised in producing the Groundnut Shell Ash concrete (GSAC) with concrete cubes measuring 150 × 150 × 150 mm. The compressive strength of the control and that of varying the percentage content of the Groundnut Shell Ash (GSA) decreased with an increase in the curing age. The control sample returned the highest compressive strength of 24.00 N/mm^2 with 5% replacement level returning a compressive strength value of 20.90 N/mm^2 after 28 days curing. This research hence opined that the substitution of cement with 5% Groundnut Shell Ash content in natural aggregate concrete production is feasible.

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A global consortium of the scientific fraternity, scholars, educationists, industry leaders and entrepreneurs to collaborate, share ideas and knowledge to resolve challenges across medicine, science, technology and business

Our Vision

“We aim to bring the research and innovations happening across the parts of the globe to facilitate interaction, knowledge sharing and exchange. We also aim to inspire university professors, students, researchers, clinicians and entrepreneurs from across the disciplines including but not limited to clinical, medical, business, technology, healthcare and pharmaceutical fields. Our dream is to bring advancements in the Science and Technology to the mankind through our scientific gatherings and deliberations. We believe in introducing novel methods and innovative techniques in science, business and technology to provide understanding on the developments”.

Our Mission

How do we serve our target groups in the scientific & business community?

- We bring the untold research accessible for many.
- Our events meet the research needs of the target groups across the academia, industry, corporates, the government, non-government agencies and public bodies.
- We Engage. Enlighten. Empower people deprived of information.
- We connect the international giants towards finding simple solutions to the complex medical and healthcare challenges of the globe.
- We unveil the unlimited research opportunities to the sections of population that is away from the developments in science and technology.
- We encourage Young and emerging researchers and scholars.
- We extend continuous education credits to boost the career and academic progress.
- We encourage start-ups in science, technology and business for the social and economic empowerment of the enthusiastic entrepreneurs.

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