Sl. No.	IIT Ropar List of Recent Publications with Abstract Coverage: May, 2022
1.	α, β-Unsaturated Carbonyls for One-Pot Transition-Metal-Free Access to 3, 6-Dihydro-2 H-pyrans P Kumar, N Kaur, R Kumar, P Banerjee – The Journal of Organic Chemistry, 2022 **Abstract:** An efficient protocol has been developed for accessing mono-, di-, and trisubstituted 3,6-dihydro-2*H*-pyran derivatives by simply subjecting α,β-unsaturated carbonyls to the carefully optimized Corey–Chaykovsky reaction conditions. The strategy provides selectively substituted dihydropyran derivatives in good to excellent yields with a broad substrate scope under very mild reaction conditions. Easy transformation of the final 3,6-dihydro-2*H*-pyran to the valued 5,6-dihydro-2*H*-pyran-2-one and tetrahydro-2*H*-pyran derivatives expanded the scope of this methodology to diverse oxacycles. Further, the developed strategy also found application in a two-step route to racemic goniothalamin, which is widely studied for its cytotoxic behavior.
2.	A Bi-level Assessment of Twitter Data for Election Prediction: Delhi Assembly Elections 2020 M Singh, SRS Iyengar, A Saxena, R Kaur – Companion Proceedings of the Web Conference 2022 (WWW '22 Companion), 2022 **Abstract:** Elections are the backbone of any democratic country, where voters elect the candidates as their representatives. The emergence of social networking sites has provided a platform for political parties and their candidates to connect with voters in order to spread their political ideas. Our study aims to use Twitter in assessing the outcome of the Delhi Assembly elections held in 2020, using a bilevel approach, i.e., concerning political parties and their candidates. We analyze the correlation of election results with the activities of different candidates and parties on Twitter, and the response of voters on them, especially the mentions and sentiment of voters towards a party over time. The Twitter profiles of the candidates are compared both at the party level as well as the candidate level to evaluate their association with the outcome of the election. We observe that the number of followers and the replies to candidates' tweets are good indicators for predicting actual election outcomes. However, we observe that the number of tweets mentioning a party and the temporal analysis of voters' sentiment towards the party shown in tweets are not aligned with the election result. Moreover, the variations in the activeness of candidates and political parties on Twitter with time also not very helpful in identifying the winner. Thus, merely using temporal data from Twitter is not sufficient to make accurate predictions, especially for countries like India.
3.	A Current Controller Gain Characterization of Weak Grid Coupled Solar Inverter Through Impedance Interaction Modeling BK Gupta, SR Kondapalli – IEEE Transactions on Industrial Electronics, 2022 **Abstract**: The Interface inverters arbitrate the network impedance based on the source characteristics for efficient solar energy harvesting. The wide impedance arbitration capability of the interface inverter defines the wide operational integrity with the AC network. In the weak grid scenario, the uncompensated grid inductance beyond PCC offers the negative damping for power oscillations at the point of common coupling (PCC) tugs the system towards instability. In this work, the negative damping influence due to interactions between the system impedance (filter inductance and grid power injection resistance) and AC network impedance (grid inductance) on the inverter closed loop controller is characterized by observing the natural phase deviations in real and imaginary axis. Through distinguished systems natural response, a novel

	second-order system impedance model is derived, and proposed current controller gain characterization aiming to achieve positive damping to mitigate the PCCs oscillations. Further tuning of the controller based on the natural response of the derived impedance model accomplishes the enhanced grid injected power quality. The efficacy of the derived system impedance model along with coherence of current controller gain is demonstrated on hardware for enhanced power quality under the stable operating region.
4.	A New Fault-Tolerant Scheme for Switch Failures in Dual Active Bridge DC-DC Converter PS Bhakar, K Jayaraman – IEEE Journal of Emerging and Selected Topics in Power Electronics, 2022 **Abstract**: The dual active bridge (DAB) dc-dc converter is widely investigated for applications such as solid-state transformers, battery energy storage systems and EV chargers. Failures in active devices of the DAB can cause reduced terminal voltages or uncontrollable currents eventually leading to converter disconnection. The above-mentioned consequences cannot be corrected by disabling the complementary switches of the faulty leg or reconfiguring the full-bridge DAB to a half-bridge DAB topology. In this paper, a new fault-tolerant approach is proposed that works for both short-circuit or open-circuit failures in the active devices of the DAB dc-dc converter. Parallel combination of a fault-tolerant capacitor and a fast acting fuse, known as fault-tolerant unit, is connected in series with the primary as well as secondary of the transformer. Once the fault is detected, the output voltage is boosted to its pre-fault value through the incorporation of fault-tolerant capacitors along with variation in control parameters, ensuring the continuity of operation. The proposed post-fault reconfiguration scheme is validated experimentally using a 1kW, 250V DAB prototype.
5.	A note on a variant of a conjecture of Rohrlich T Chatterjee, S Dhillon – Mathematika, 2022 **Abstract**: Around the late 1970s, Rohrlich made a conjecture about multiplicative algebraic relations among the special values of the Γ- function. Later, Lang generalized the Rohrlich conjecture to polynomial algebraic relations among special values of the gamma function. In 2009, Gun et al. (J. Number Theory 129 (2009), no. 8, 1858–1873) formulated a variant of this conjecture of Rohrlich and a variant of the conjecture of Lang that deals with the linear independence of the values at non-integeral rational numbers of the logarithm of the gamma function over the field of rationals and algebraic numbers, respectively. In this direction, they proved a set of interesting results for the case of primes and their powers over the field of rationals. Further for the case of prime powers, they have extended their results assuming the Schanuel's conjecture. In this article, we improve their results without assuming Schanuel's conjecture. Further we provide counter examples to these variants of conjectures of Rohrlich and Lang for an infinite class of integers having at least two prime factors satisfying certain conditions.
6.	A novel variable refrigerant flow system with solar regeneration-based desiccant-assisted ventilation G Singh, R Das – Solar Energy, 2022 **Abstract**: Variable refrigerant flow (VRF) based air-conditioning systems provide better thermal comfort with respect to the conventional all-air systems involving either constant air volume (CAV) or variable air volume (VAV) technique. In this study, a novel VRF strategy involving potential of improved indoor air quality has been proposed by integrating solar energy with desiccant-assisted dedicated outdoor air system (DOAS). DOAS is responsible for ventilation and humidity control. An indirect evaporative cooling arrangement is incorporated in the path of supply air from desiccant for reducing the load on the VRF system. Using Energyplus simulations, thermal and electrical energy characteristics of the proposed system have been investigated for three climatic conditions. A comparative assessment of the novel system has

	been made against the conventional VRF and all-air VAV air-conditioning system. Results show that for warm-humid climate, electrical energy saving potential of the proposed solar energy-assisted VRF system is around 23.9 % and 9.5 % than the conventional all-air VAV and VRF systems, respectively. Under composite climate the saving offered by the proposed system with respect to VAV and VRF is determined as 13.8 % and 9.4 %, respectively. Finally, the energy saving obtained with solar energy based VRF for the hot-dry climate is 17.5 % and 11.6 % against conventional all-air VAV and VRF systems, respectively. Excellent solar fraction is observed for composite and hot-dry climates, whereas for warm-humid climate, it is determined as 0.97. A comparative analysis with conventional cooling coil assisted DOAS-VRF system also shows energy savings by the proposed system.
7.	A series representation of euler stieltjes constants and an identity of Ramanujan T Chatterjee, SS Khurana – Rocky Mountain Journal of Mathematics, 2022 **Abstract**: We derive a series representation of the generalized Stieltjes constants which arise in the Laurent series expansion of partial zeta function at the point s =1. In the process, we introduce a generalized gamma function and deduce its properties such as functional equation,Weierstrass product and reflection formulas along the lines of the study of a generalized gamma function introduced by Dilcher in 1994. These properties are used to obtain a series representation for the k-th derivative of Dirichlet series with periodic coefficients at the point s =1. Another application involves evaluation of a class of infinite products of which a special case is an identity of Ramanujan.
8.	A unique 2.1 V “Water in Salt” elemental sulfur based Na-ion hybrid storage capacitor M Kumar, TC Nagaiah – Journal of Materials Chemistry A, 2022 **Abstract**: The aqueous sodium-ion hybrid capacitor is a novel energy storage device that reconciles the high energy and power density in a single device along with the inherent safety and conductivity of an aqueous electrolyte. However, the low capacity of electrode materials, low water stability window, and kinetic incongruity between the two types of materials present a daunting challenge that has hindered its widespread application. Herein we have manifested a new elemental sulfur based Na-ion/S hybrid storage capacitor featuring mesoporous nitrogen-containing carbon (MNC) anchoring sulfur as a negative and $Na_{0.44}MnO_2$ as a positive electrode material in “Water in Salt” Electrolyte (WiSE). The resultant device delivers an output voltage of 2.1 V with an impressive energy density of 84.33 W h kg^{-1} and a maximum power density of 6.683 kW kg^{-1} with a remarkable 81.5% capacitance retention after 5000 cycles at 10 A g^{-1}. Besides, for the first time, an entirely paper-based Na-ion/S hybrid storage capacitor was constructed that demonstrates high flexibility and energy output under extreme conditions of twisting and bending, and even after punching holes. These results suggest a new high-performance energy storage device with great potential for practical application.
9.	Access to 5‐Substituted 3‐Aminofuran/thiophene‐2‐carboxylates from Bifunctional Alkynenitriles C Kumari, A Goswami – Advanced Synthesis & Catalysis, 2022 **Abstract**: An atom-economical approach for the synthesis of 3-aminofurans/thiophenes via a conjugate addition of alcohols and thiols with electron withdrawing groups (EWGs) at α positions on alkynenitriles followed by a modified Thorpe-Ziegler cyclization have been reported. This operationally simple protocol offers a rapid access to a library of 3-aminofurans/thiophenes in moderate to good yields.
10.	Activation-Induced Surface Modulation of Bio-Waste-Derived Hierarchical Porous Carbon for Supercapacitors P Sharma, D Singh, M Minakshi, S Quadsia, R Ahuja – ChemPlusChem, 2022

	Abstract: Wheat straw-derived carbon from the Wheatbelt region in Western Australia was subjected to chemical activation in an electrolyte containing either acid or base treatment. The findings showed an increase in electron/hole mobility towards the interfaces due to the presence of different surface functional groups such as C-SOx-C and S=C in the carbon framework for acid activation. Likewise, the galvanostatic capacitance measured at a current density of 2 mA cm −2 in a three-electrode configuration for acid-activated wheat straw exhibited 162 F g −1 , while that for base-activated wheat straw exhibited 106 F g −1 . An increase of 34.5% more capacitance was achieved for acid-treated wheat straw. This improvement is attributed to the synergistic effects between surface functional groups and electrolyte ions, as well as the electronic structure of the porous electrode.
11.	Adaptive increment based uniform sheet stretching in Incremental Sheet Forming (ISF) for curvilinear profiles HK Nirala, A Agrawal – Journal of Materials Processing Technology, 2022 **Abstract**: Incremental Sheet Forming (ISF) is a rapid prototyping based die-less forming process. In this process, curved end based forming tool deforms the sheet by a user-defined Numerical Control (NC) toolpath. This paper focuses on the formability response of the sheet stretching during the ISF process. The stretching in the axial direction primarily depends on the wall angle of the profile and the incremental depth. During the die-less deformation of the constant wall angle based geometries (truncated cone or pyramid); with each increment uniform stretching of the sheet occurs. However, in case of the variable wall angle-based geometries (curvilinear wall profiles), higher sheet stretching occurs at steep wall angles. Adaptive increment based strategy has been developed for the die-less forming of the curvilinear geometries so that uniform sheet stretching in the axial direction can be sustained. The response of the developed strategy towards sheet formability, equivalent stress and strain distribution has been investigated in this study. For implementation, the toolpath for the Finite Element Analysis (FEA) simulations (ABAQUS®) and experimentation has been defined using an in-house developed Computer-Aided Manufacturing (CAM) module. Experimental and simulation results exhibit the improvement in the sheet thickness and stress distribution.
12.	An anisotropic localizing gradient damage approach for failure analysis of fiber reinforced composites A Negi, A Soni, S Kumar – Composite Structures, 2022 **Abstract**: This article presents an anisotropic gradient-enhanced continuum damage model developed within the finite element method framework to address complex fracture phenomena in anisotropic layered materials with unidirectional fiber-reinforced composites as the primary material examples. The main objective of the work is to model damage anisotropy due to progressive intra-laminar fracture at mesoscale in transversally isotropic composite laminae using distinct damage variables associated with different in-plane failure modes. Departing from the conventional gradient enhancements, the model adopts an improved spatial nonlocal description to ensure correct localized damage bandwidths using a single internal length scale. The coupled system of equations is decoupled using an operator-split (staggered) methodology to ensure a robust and straightforward computational implementation without compromising accuracy using lower order finite elements. The proposed damage model is tested on experimental results of fracture response in a single-edge notched tension, center notched tension, and open-hole tension fiber-reinforced composite laminae, where the numerical results were consistent with experimental observations.
13.	An efficient multiscale bi-directional PBM-DEM coupling framework to simulate one-dimensional aggregation mechanisms A Das, T De, G Kaur, M Dosta, S Heinrich, J Kumar – Proceedings of the Royal Society A, 2022

	Abstract: The mesoscale population balance modelling (PBM) technique is widely used in predicting aggregation processes. The accuracy and efficiency of PBM depend on the formulation of its kernels. A model of the volume- and time-dependent one-dimensional aggregation kernel is developed for predicting the temporal evolution of the considered particulate system. To make the developed model physically relevant, the PBM model needs three unknown parameters as input: volume-dependency in collisions, collision frequency per particle and aggregation probability. For this, the microscale discrete element model (DEM) is used. The system's collision frequency is extracted periodically using a novel collision detection algorithm that detects and ignores duplicate collisions. Finally, a multiscale bi-directional PBM–DEM coupling framework is presented to simulate the aggregation mechanism. PBM and DEM simulations take place periodically to update the particle size distribution (PSD) and extract the collision-frequency, respectively. The coupling framework successfully explains the dependence between the PSD and the collision frequency. Additionally, computational cost of the algorithm is optimized while maintaining the accuracy of the results. Lastly, the accuracy and efficiency of the developed framework are verified using two different test cases. In one of the examples, a simple aggregation is simulated directly inside the DEM for the first time.
14.	Architectural design and development of an upper-limb rehabilitation device: a modular synthesis approach S Gupta, A Agrawal, E Singla – Disability and Rehabilitation: Assistive Technology, 2022 **Abstract**: **Purpose** Enormous assistance is required during rehabilitation activities, which might result in a variety of complications if performed manually. To solve this issue, several solutions in the form of assistive devices have been presented recently. Another issue highlighted is the lack of kinematic compatibility in low degrees-of-freedom (dof) systems. The proposed approach of developing a human-motion-oriented rehabilitation device deals with the problem through hybrid architectures. A novel modular synthesis approach is used for the purpose to induce generality in the design process. **Materials and methods** Using a modular strategy, three planar hybrid configurations are generated for two-dof mechanisms for supporting flexion/extension motion. Three such architectures are optimally synthesised and kinematically analysed over the entire workspace. A Genetic Algorithm (GA) is used to synthesise the architecture parameters optimally. Moreover, the outcomes are evaluated against a set of seven poses and posture locations of the wrist to choose the most suitable configuration among the others. Subsequently, kinematic compatibility is analysed for the coupled system – formed by the selected architecture and the human arm – while wearing the proposed mechanism. **Results** According to the findings of optimal synthesis, workspace and singularity analysis, configuration-III is capable of achieving the optimal postures for all task space locations (TSLs). Further, the work modifies the design by attaching additional three revolute passive joints for correcting misalignment concerns using coupled mobility analysis. **Conclusion** The modular strategy for hybrid architectures and the subsequent mobility analysis provides an algorithmic framework for synthesising a task-based rehabilitation device.
15.	Astrophysical reaction rates with realistic nuclear level densities Sangeeta Ghosh, T Maheshwari, B Saxena, BKG Agrawal – Physical Review C, 2022 **Abstract**: Realistic nuclear level densities (NLDs) obtained within the spectral distribution method (SDM) are employed to study nuclear processes of astrophysical interest. The merit of SDM lies in the fact that the NLDs corresponding to many-body shell-model Hamiltonians consisting of residual interaction can be obtained for the full configurational space without recourse to the exact diagnolization of huge matrices. We calculate NLDs and s-wave neutron

	resonance spacings which agree reasonably well with the available experimental data. By employing these NLDs, we compute reaction cross sections and astrophysical reaction rates for radiative neutron capture in few Fe-group nuclei and compare them with experimental data as well as with those obtained with NLDs from phenomenological and microscopic mean-field models. The results obtained for the NLDs from SDM are able to explain the experimental data quite well. These results are of particular importance since the configuration mixing through the residual interaction naturally accounts for the collective excitations. In the mean-field models, the collective effects are included through the vibrational and rotational enhancement factors, and their NLDs are further normalized at low energies with neutron resonance data.
16.	Attitude, Subjective Norms, and Perceived Behavioural Control as Predictors of Entrepreneurial Intentions Among Engineering Students A Mishra, P Singh – Prabandhan: Indian Journal of Management, 2022 **Abstract**: Entrepreneurship, a significant factor affecting the economy and well-being, is being nurtured by a range of opportunities and programs by the government across several sectors. While these initiatives focus on making physical resources accessible to the aspirants, psychological resources required for successful entrepreneurship have not been focused upon rigorously, especially in India. Entrepreneurial intention has been identified as a significant predictor of entrepreneurial behavior, and understanding its dynamics to promote it is the need of the hour. Entrepreneurship is considered an intentionally planned activity; therefore, the entrepreneurial intention could be explained by the theory of planned behaviour (TPB) factors consisting of attitude, subjective norms, and perceived behavioural control. This study aimed to examine the relationship between TPB components and entrepreneurial intention. The cross-sectional study design was employed to collect the data from 170 students (M = 18.42, SD = 1.02) studying in various engineering colleges in Punjab. The Entrepreneurial Intention Questionnaire (EIQ) developed by Liñán and Chen (2009) was used to measure the responses. The data were subjected to mainly correlation and regression analysis. The results indicated a strong association of attitude and perceived behavioural control with entrepreneurial intentions ; whereas, subjective norms reflected a weak association with entrepreneurial intentions. Moreover, perceived behavioural control and attitude towards entrepreneurship were strong predictors of entrepreneurial intentions for this Indian sample. The findings provide educators, administrators, and policy makers valuable insights about the factors to be targeted to strengthen entrepreneurship among budding entrepreneurs.
17.	Augmenting Knowledge Distillation with Peer-to-Peer Mutual Learning for Model Compression U Niyaz, DR Bathula – Proceedings - International Symposium on Biomedical Imaging, 2022 **Abstract**: Knowledge distillation (KD) is an effective model compression technique where a compact student network is taught to mimic the behavior of a complex and highly trained teacher network. In contrast, Mutual Learning (ML) provides an alternative strategy where multiple simple student networks benefit from sharing knowledge, even in the absence of a powerful but static teacher network. Motivated by these findings, we propose a single-teacher, multi-student framework that leverages both KD and ML to achieve better performance. Furthermore, an online distillation strategy is utilized to train the teacher and students simultaneously. To evaluate the performance of the proposed approach, extensive experiments were conducted using three different versions of teacher-student networks on benchmark biomedical classification (MSI vs. MSS) and object detection (Polyp Detection) tasks. Ensemble of student networks trained in the proposed manner achieved better results than the ensemble of students trained using KD or ML individually, establishing the benefit of augmenting knowledge transfer from teacher to students with peer-to-peer learning between students
18.	Breakdown Characteristics of Liquid Silicone Rubber in Needle-Plane Configuration Under Polarity Reversal

	AJ Thomas, P Johri, CC Reddy – IEEE Transactions on Dielectrics and Electrical Insulation, 2022 **Abstract**: The results of breakdown voltages in liquid silicone rubber (LSiR) insulation under stepped polarity reversal voltages at a uniform temperature in a needle-plane electrode system are presented in the paper. In the presence of defects like sharp conductor projections or protrusions in the cable insulation stressed under polarity reversal direct current (DC) voltages, the electric field distribution is far more complex due to nonlinear insulation conductivity and time-dependent field distribution. The electric field distribution and space charge accumulation are intricate functions of factors like geometry and nonlinear conduction. In this paper, a two-dimensional (2D) axisymmetric model of a needle-plane geometry is developed using finite element method to compute the time-dependent field, space charge and current density distribution under polarity reversal DC, which, apparently did not get much attention until now. Interesting results on the effect of polarity transition time, applied polarity time step on the above-mentioned distributions are addressed and presented. The pronounced effects of nonlinear conductivity on the time-dependent field distribution are also demonstrated. Furthermore, from the breakdown experiments conducted on tip-plane electrode system for different tip radii and applied time steps, the results put forward a rational and practical estimate of the breakdown field, using the proposed model.
19.	Bulk nanobubbles in aqueous salt solution K Agarwal, M Trivedi, N Nirmalkar – Materials Today: Proceedings, 2022 **Abstract**: We have investigated the nanobubble generation, characterization, and their stability in monovalent and multivalent salt solution. The solubility of gases in aqueous salt solution decreases with salt concentration and this effect is the so-called “salting out effects” of dissolved gases. The dissolution of salt in water leads to dissociation of salt into ions and presence of water molecules results in solvation of ions. The solvation weakens the affinity of non-polar oxygen molecules in water and thus tends to out the dissolved oxygen from the water molecules. We have experimentally observed that dissolved gas releases in the form of nanobubbles in the bulk liquid. Nanoparticle tracking analysis (NTA) have been used to characterize the size and bubble number density of nanobubbles. The surface charge of the nanobubbles is characterized in terms of zeta potential of the nanobubbles releasing during salting out of the dissolved gases. The effect of the mono and multivalent salts has been investigated. The stability of nanobubbles is reported by measuring the bubble size distribution over the period of time. The nanobubbles are observed to stable for more than 3 days.
20.	Cationized silica ceria nanocomposites to target biofilms in chronic wounds N Rasool, R Srivastava, Y Singh – Biomaterials Advances, 2022 **Abstract**: Altered wound healing is a major challenge faced by both developed and developing nations. Biofilm formation has been identified as one of the causative factors for the progression of chronic wounds. The spread of biofilm is controlled by inhibiting the biofilm formation or disrupting the mature biofilm. Functional nanomaterials/enzymes with antimicrobial effects, such as metal oxides, rare earth metals, and carbon nanoparticles have been investigated to treat biofilm and overcome the drawbacks associated with the antibiotic therapy. Cerium oxide nanoparticles (CNPs) have drawn significant attention as a promising antimicrobial agent owing to their antibacterial, enzyme-mimetic, and crystalline properties but they suffer from poor colloidal stability and dispersity in an aqueous environment and size-dependent function. In this work, we have developed a functionalized silica ceria nanocomposite (FSC), as an antibiotic-free system, to treat biofilms. The FSC possesses a high surface area of mesoporous silica nanoparticles (MSNs) combined with the intrinsic antibacterial activity of cerium oxide for biofilm inhibition. The nanocomposite was fabricated using silica and ceria precursors, and it exhibited a high surface area of 436 m^2/g and an average particle size of around 450 nm. The physical and chemical properties of nanocomposite were characterized using FTIR, XRD, UV–Vis, BET, EDX, and XPS analysis. It exhibited a potent antioxidant

	activity (86%), positive haloperoxidase mimetic property, and broad-spectrum antibacterial activities. It showed 99.9% inhibition against *S. aureus* (Gram-positive) and 81% inhibition against *E. coli* (Gram-negative) within 12 and 24 h along with the significant inhibition of biofilm formation (80%) as well as the disruptive effect against the established biofilm (77%) of *S. aureus*. Cell viability assays indicated the proliferative nature of composite in normal basal conditions and increased cell viability (97%) in the presence of oxidative stress. Despite being a cationic nanomaterial, it showed a good hemocompatibility against human blood and caused complete wound closure in mouse fibroblast cell line within 24 h. The functionalized silica ceria nanocomposite developed has a strong potential in chronic wound healing applications.
21.	Computational study on effect of enclosure shapes on melting characteristics of phase change material around a heated cylinder G Mishra, A Memon, AK Gupta, N Nirmalkar – Case Studies in Thermal Engineering, 2022 **Abstract**: This work investigates the melting and heat transfer characteristics from an isothermally heated circular cylinder placed inside twelve differentially shaped enclosures filled with the lauric acid (PCM). Extensive results are reported on streamlines, temperature contours, and rate of melting to delineate the influence of enclosure shape on the melting performance of thermal energy storage (TES) unit. The study is conducted at two different surface temperatures of the heated cylinder, namely, 333.15 K and 343.15 K. The time required to reach the fully melt condition largely depends on the amount of PCM above the heated cylinder and the interaction between the thermal boundary layers at the adiabatic wall and the cylinder surface. Among all shapes considered, the inverted semi-circular enclosure yields the fastest melting. Simple modifications in the geometrical shape of the enclosure are seen to significantly reduce the melting time (by ~four times) required to reach the fully melt condition thereby expediting the energy storage process. Thus, such elementary geometrical changes in the TES systems can hugely benefit by reducing the energy losses and yield larger industrial margins. At the end, limited results are also included for the complete melting-solidification cycle for the utilization of the results in a broader spectrum.
22.	Dancing through patriarchy: garba as a means of resistance in Abhishek Shah's Hellaro M Jha – South Asian History and Culture, 2022 **Abstract**: The medium of dance can offer routes other than textual and verbal for expressing women's oppression and also their resistance to it. The folk dance of *garba* in the Gujarati film *Hellaro* (*The Outburst*, 2019) directed by Abhishek Shah is an exemplary instance of this. Further, the present essay traces the history of this dance form to explore the filmic reversal of the traditional understanding concerning *garba*. *Garba* changes in the film from being a ritualistic and religious performance to a recreational one, thematically linking women's leisure as a mode of resistance to patriarchy. Moreover, such an understanding of *garba* serves to highlight women's negotiation of agency in their everyday lives through nonverbal cues, as in the film.
23.	Development and characterization of Al-Si-Cu-Zn-Sn brazing filler alloy using vacuum arc furnace S Chand, S Bhardwaj, K Rakha, R Mohan Prasad, U Batra – Materials Today: Proceedings, 2022 **Abstract**: Al-12Si filler alloy are used as brazing filler material for brazing titanium. In the present work, aluminium-based Al-12Si-xCu-0.5Zn-0.5Sn (wt %) (x = 0.5, 1, 1.5, 2) brazing filler alloys were developed using vacuum arc melting process. Structural characterization of the brazing filler alloy was done using XRD, Optical Microscopy and Differential Scanning Calorimetry (DSC). XRD results confirm the absence of intermetallic phases in the brazing filler alloy. Hardness measurement showed that hardness of alloy increases with increasing amount of Cu in the alloy with a maximum hardness of 86 HV. DSC analysis revealed a melting temperature of 570 ℃ of the Al-12Si-1Cu0.5Zn-0.5Sn alloy. Electrochemical behavior of the filler alloys were also studied.

24.	Does development assistance reduce climate vulnerability in developing countries? an empirical investigation P Jain, S Bardhan – Climate and Development, 2022 **Abstract**: Increasing climate vulnerability in developing countries impedes inclusive and sustainable development. The paper examines the linkages between official development assistance (ODA) and climate vulnerability while analysing the mediating role of adaptation readiness in 119 developing countries using a panel correlated standard error estimator. The study also investigates the relationship between ODA's sectoral composition and climate vulnerability. The findings reveal that ODA is positively associated with climate vulnerability across all models and regions. However, ODA disbursement according to governance readiness criteria is associated with low vulnerability. The sectoral analysis reveals that the share of social infrastructure, humanitarian, and debt assistance is more in highly vulnerable countries. In contrast, these countries receive less aid specific to production, economic infrastructure, and multi-sector, and donors commit most climate-related ODA in these sectors. Overall, findings suggest a lack of adaptation mainstreaming into ODA disbursements. Furthermore, it calls for exploiting unexplored opportunities for vulnerability reduction through ODA in those sectors where the share of ODA is high in vulnerable countries.
25.	Effect of material inhomogeneity under creep and plastic to creep transition of cracks A Tiwari – Procedia Structural Integrity, 2022 **Abstract**: The driving force of a crack in a non-linear elastic material is described by the conventional J-integral, J (Rice 1968). For elastic-plastic materials, J does not describe the crack driving force. However, it describes the intensity of the crack tip field and can be, therefore, used to quantify the fracture toughness (Rice 1968). For the high-temperature behaviour of materials where creep deformation dominated, analogous parameter to J-integral were deduced, the C*-integral and a similar parameter, the C_t-integral (Landes and Begley 1976). C*has been proven to have a good correlation with the creep crack growth rate for many materials, mostly under extensive creep conditions. However, it does not describe the crack driving force. Based on the concept of configurational forces, a J -integral for elastic-plastic materials, J_{ep}, was derived, which is able to quantify the true crack driving force in accordance with incremental theory of plasticity [4]. Hereby, the plastic strain is treated as an eigen-strain. J_{ep}can be applied also in cases of non-proportional loading, e.g. for a growing crack (Simha et al. 2008) or for cyclic loading conditions (Ochensberger and Kolednik 2015). In this work, the concept of configurational force is applied to evaluate the crack driving force under small, medium and extensive creep conditions. Hereby, the creep strain is treated as a time dependent eigenstrain. A case study is performed where the path dependences of the elastic-plastic J-integral, J_{ep}, and the conventional parameters $C_t$and C*are studied for materials which undergo elastic+creep deformation, with material inhomogeneity. It has been confirmed in the recent studies (Kolednik et al. 2014, Tiwari et al. 2020) that the material inhomogeneity term affects the crack depending on the nature of material inhomogeneity. This effect is unknown for creep deformation and the same has been studies on idealized fracture specimen under creep deformation using configurational forces and finite element method simulating real situations of dissimilar metals used at high temperatures in nuclear power plants and jet engines.
26.	Effects of various parameters on the performance of electrostatic precipitator: A numerical approach A Varshney, N Mishra, R Das, GS Sinha – International Journal of Energy for a Clean Environment, 2022 **Abstract**: This paper presents the numerical simulation of the electrostatic precipitator (ESP). In this study, a detailed analysis of the ESP is completed based upon different parameters. The main objective of this simulation was to calculate the effects of various parameters on the performance of the ESP, i.e., collection efficiency, total number of accumulated charged particles

	etc. Results show that applied voltage at the electrodes has a significant influence on the collector's performance and at 25 kV collection efficiency reached 100%, for 5 µm and the total number of accumulated charged particles were 1.5×104. Furthermore, results show that the larger the size of particle larger the collection efficiency, and the larger will be the accumulated particles.
27.	Erosion wear performance of HVOF and cold spray coatings deposited on T-91 boiler steel S Singh, JS Grewal, K Rakha – Materials Today: Proceedings, 2022 **Abstract**: Erosion wear in boiler tubes in coal based boilers is one of the serious problem and often results in downtime. After studying the literature, it was observed that thermal spray coatings are one of the effective solutions in reducing the erosion wear of boiler tubes. In this research work, the comparative erosion wear study of uncoated, HVOF coated and Cold spray coated samples of T-91 steel in simulated coal fired boiler conditions were performed. The Ni powder coatings were deposited on the substrate and impacted at 30°, 60° and 90° impingement angles with alumina erodent employing an air jet erosion tester. The erosive wear with respect to weight loss was maximum at 30° impingement angle, that was reduced at an impingement angle 60° and minimum at an impingement angle of 90°. This is erosive wear behavior of ductile materials. The erodent discharge rate was fixed at 2 g/min and air temperature at 800 °C. The cold spray coatings can reduce the weight loss from 40 to 60%.
28.	Exclusion process with scaled resources: Delocalized shocks and interplay of reservoirs B Pal, AK Gupta – Physical Review E, 2022 **Abstract**: In this paper we study a conserved system comprised of two directed lanes having identical dynamics and two reservoirs with scaled resources that are strategically connected to the boundaries of the lanes, forming a ringlike structure. The steady-state properties of the system have been analyzed in the framework of mean-field theory. Our findings display a rich behavior, emphasizing the nontrivial effects of incorporating two reservoirs. As a consequence, two distinct phases that admit delocalized shocks emerge and occupy a significant region in the phase diagram. Moreover in one of theses phases, each lane admits a delocalized shock whose movements are perfectly synchronized. In another phase, the single shock in the system may traverse both lanes or remain restricted to a single lane, depending upon the size of the system. All the findings are validated by Monte Carlo simulations.
29.	Exploration of a Psychological Defensive Syndrome Against Depressive Symptomatology in a Community Sample of Indian Women P Singh, N Mishra – Psychological Reports, 2022 **Abstract**: The prevalence of depressive symptomatology in Indian women and the associated treatment gap are alarming and require interventions at a community level. Such interventions may succeed if the specific risk and protective factors are appropriately identified and addressed. Identifying such factors may suggest a Psychological Defensive Syndrome (PDS) against depressive symptomatology, and inculcating this PDS through specific interventions may help individuals manage depressive symptomatology. For evaluating the feasibility of such an idea, a two-phase research project was initiated, and the current paper presents findings of its first phase. The primary aim of the first phase was to explore the predictive relationship between depressive symptomatology and rumination, reappraisal, resilience, self-efficacy, neuroticism, and extraversion. A total of 671 women (M_{age} = 23.71) responded to standardized questionnaires in a semi-structured interview setting. The obtained data were subjected to correlational, regression, and path analysis. The findings support all the hypotheses; women, who reported less engagement in rumination and more in reappraisal, who scored low on neuroticism and high on extraversion, resilience and self-efficacy, showed less severe depressive symptoms than their counterparts. This pattern can be thought of as a PDS against depressive symptoms in Indian

	women. These results highlight the importance of addressing these factors in preventing and assuaging depressive symptomatology in Indian women.
30.	Exploring Electronic Structure and Optical Properties of 2D Monolayer As_2S_3 by First-Principle's Calculation R Ahuja, AR Patel, D Singh, PB Thakor, Y Sonvane – Materials Research Proceedings, 2022 **Abstract**: In the present work, the structural, electronic and optical properties of the 2D monolayer As2S3 have been systematically investigated by the first principles calculations. The monolayer As2S3 has stable structure in the 2D oblique lattice which is confirm by phonon dispersion. Here, the elemental projected band-structure and density of states of the monolayer As2S3 have been determined by using HSE functional. The calculated bandgap of the monolayer As2S3 has 3.29 eV (of the indirect nature). In the optical properties, the complex dielectric function and optical absorption spectrum have been studied. The results suggest that the 2D monolayer As2S3 as hopeful candidate for potential applications in nano-electronics and opto-electronics.
31.	Fabrication of NiFeB flexible electrode via electroless deposition towards selective and sensitive detection of dopamine A Kafle, N Thakur, TC Nagaiah – Journal of Materials Chemistry B, 2022 **Abstract**: A novel cost-effective and eco-friendly flexible electrochemical sensor was designed for highly selective and sensitive detection of dopamine to deal with the problems related to serious neurological disorders. The novel flexible paper electrode with NiFeB synthesised by simple dip-coating exhibits a high sensitivity of 35.35 μA μM^{-1} cm^{-2}, 2.36 μA μM^{-1} cm^{-2} and 0.215 μA μM^{-1} cm^{-2} in the linear ranges from 10 nM to 1 μM, 5 μM to 50 μM and 100 μM to 400 μM, respectively, with an ultra-low detection limit of 2.1 nM. Besides, the free-standing flexible electrode for the detection of DA, the flexible paper sensor displayed superior selectivity towards various interferents, such as ascorbic acid, glucose and uric acid, as well as stability under various deformations.
32.	FE analysis of Ultrasonic vibration assisted turning of magnesium AZ31B alloy N Deswal,R Kant – Materials Today: Proceedings, 2022 **Abstract**: Ultrasonic vibration assisted turning (UVAT) is advanced machining process where vibrational assistance of high frequency and low amplitude is provided to tool. In the present study, a two dimensional (2D) numerical simulation is carried out in ABAQUS/Explicit to compare the machinability of AZ31B magnesium alloy with tungsten carbide as a cutting tool during the conventional turning (CT) and UVAT processes. The objective of this study is to compare the effective stress distribution, cutting and thrust forces, and machining temperature during the CT and UVAT processes. The simulation results showed that the average stress distribution during UVAT is reduced to about 40% compared with CT. However, the average stress distribution is comparable during CT and the penetration stage of the UVAT process. Furthermore, the average cutting and thrust forces were reduced by 69% and 65% respectively in UVAT than CT. Although, the machining temperature in UVAT is found to be around 37% higher than that in CT. The results revealed that the UVAT has many advantages over CT and the machinability can be improved significantly by incorporating vibrations to the conventional turning process.
33.	Flexible 3D porous boron nitride interconnected network as a high-performance Li-and Na-ion battery electrodes N Khossossi, D Singh,W Luo, R Ahuja – Electrochimica Acta, 2022 **Abstract**: To achieve the high-rate efficiency in a electrochemical energy storage technologies, it is vital for the battery anode to be electronically as well as ionically conductive. Such a requirement has boosted the survey of three-dimensional (3D) porous networks made up of

	light-weight non-metallic elements, like carbon, boron, and nitride. A wide range of 3D porous materials composed of carbon and/or boron for Li/Na-ion batteries have been recently reported, whereas analogous efforts for lightest 3D porous boron nitride are yet to be addressed. In this work, we explore the 3D porous boron nitride network namely sp^3-linked zigzag BN nanoribbons (BNNRs) with a width of 1 (lz1-BN) by assembling the 2D zigzag BNNRs and its first ever application as battery anodes for Li and Na ion batteries. Upon a consistent DFT and AIMD computations, It is revealed that the 3D porous lz1-BN material is chemically and thermally stable and yields a high specific capacity of about 539.94 mAh/g with respect to the commercialized graphite (372 mAh/g for LIBs) and recently reported Janus-graphite anode (≈332 mAh/g for SIBs), fast (Li^+,Na^+)-ionic diffusion, low potential voltage, and slight volume-expansion. Such puzzling electrochemical characteristics, along with the light-weight and high abundance of B and N elements, strongly support the possibility of 3D porous BN as a desirable candidate for Li and Na-ion battery anodes.
34.	High energy density aqueous rechargeable sodium-ion/sulfur batteries in 'water in salt" electrolyte M Kumar, TC Nagaiah – Energy Storage Materials, 2022 **Abstract**: The discovery of "water in salt" electrolyte (WiSE) has resolved stability window issues of aqueous batteries. However, another aspect of forging ahead is the designing of stable high-capacity electrode materials. Herein, we have manifested a Na-ion/S battery using S@MNC-600 anode in WiSE to achieve a high-capacity of 709.13 mA h g^{-1} (w.r.t sulfur) with excellent cycling stability even up to 300 cycles at 0.5 C with 98.2 % of coulombic efficiency. Like organic electrolyte, polysulfide dissolution is a primary obstacle in aqueous electrolyte due to the strong polarity and high activity of water. In this study, various electrochemical, spectroscopic and visualization studies provide an evidence that polysulfide dissolution is sensitive towardoperating time, C-rates, and depth of discharges, which can be tuned by increasing salt concentration and sluggish kinetics was enhanced by using MNC-600 host. Post analysis demonstrates that high cycling stability in WiSE is due to the formation of stable SEI, consisting of Na_2CO_3. The full cell assembled with S@MNC-600 anode and $Na_{0.44}MnO_2$ cathode in WiSE delivered 110.6 Wh kg^{-1} energy density with remarkable stability. Further, a flexible paper-based battery demonstrates a high performance even at various deformations, making it a good contender for future energy storage applications where safety and cost are of high priority.
35.	How to Train Intelligent Reflecting Surfaces? R Singh, B Kumbhani – IEEE Communications Letters, 2022 **Abstract**: This letter discusses the rationale of Intelligent Reflecting Surface (IRS) based transmission, state-of-the-art methods available for IRS training, and their challenges. Though IRS is known for its ability to constructively combine several multipath components by using their phase information, extracting the phase information for a large number of IRS elements requires extensive training overhead. This work proposes a multi-mode grouping method for low overhead IRS training and moderate combining benefit. Moreover, the letter includes directions to adaptively utilize user's mobility and(or) quality of service requirement for the appropriate mode selection.
36.	Impact of post-COVID-19 on the hospitality tourism: Impact evaluation, survive, revive and thrive Anu, N Gautam, PK Gautam, J Singh, S Sharma, A Kaushik… – International Journal of Health Sciences, 2022 **Abstract**: Within few weeks, when the first reported COVID-19 case in the city of Wuhan, China, the pandemic has spread quickly across nations and tourism has been regarded as the main case in the spread of corona virus worldwide. With no vaccine and limited medical facilities, it plunged the economy into various economic crisis. Both the purchase and production

	has come to an end due to factory closures; travel bans and border closures. The most severe disruption of the global economy is the national quarantines and unprecedent global restrictions on traveling, bringing international travel to a standstill. As a consequence, tourism operations of many countries have been ceased in March, 2020. According to UNWTO research, 100% UNWTO countries have imposed restrictions on travelling in response to the pandemic and international tourism has completely been closed and the borders were sealed by 72% nations. Due to the cancellation of business trips, holidays, and weekend gateways, tourism industry is heavily impacted by the COVID-19 crisis. So, in this paper we have discussed the impact evaluation of COVID-19 pandemic on tourism industry and its branches. We have reviewed research papers published in 2020, OECD and UNWTO reports.
37.	Impact of Temperature on Reliability of MFIS HZO-based Ferroelectric Tunnel Junctions A Sünbül, T Ali, R Hoffmann, R Revello, Y Raffel, P Duhan… – IEEE International Reliability Physics Symposium (IRPS), 2022 **Abstract**: Hafnium oxide-based ferroelectric tunnel junctions (FTJs) are novel nonvolatile memory devices with promising advantages such as non-destructive readout in comparison to conventional ferroelectric random access memories (FRAMs). Reliability aspects of FTJ devices need to be investigated, including their endurance, retention, ferroelectric switching, breakdown characteristics, and memory window (MW). These characteristics exhibit promising results at room temperature; however, further analysis is required for different operating temperatures. Therefore, in this work, we demonstrate the FTJ device characteristics at different temperatures varying from -40 °C to 60 °C. The results indicate that high temperatures cause higher MW of FTJs, whereas the FTJ lifetime increases at lower operating temperatures.
38.	Influential Prototypical Networks for Few Shot Learning: A Dermatological Case Study R Roy Chowdhury, Bathula DR – Proceedings - International Symposium on Biomedical Imaging, 2022 **Abstract**: Prototypical network (PN) is a simple yet effective few shot learning strategy. It is a metric-based meta-learning technique where classification is performed by computing Euclidean distances to prototypical representations of each class. Conventional PN attributes equal importance to all samples and generates prototypes by simply averaging the support sample embeddings belonging to each class. In this work, we propose a novel version of PN that attributes weights to support samples corresponding to their influence on the support sample distribution. Influence weights of samples are calculated based on maximum mean discrepancy (MMD) between the mean embeddings of sample distributions including and excluding the sample. Comprehensive evaluation of our proposed influential PN (IPNet) is performed by comparing its performance with other baseline PNs on three different benchmark dermatological datasets. IPNet outperforms all baseline models with compelling results across all three datasets and various N -way, K-shot classification tasks. Findings from cross-domain adaptation experiments further establish the generalizability of IPNet.
39.	Interface Engineering of CZTS/TiO_2 Heterojunction Using Wide-Bandgap Ga_2O_3 Passivation Interlayer for Efficient Charge Extraction A Ghosh, D Kaur, K Kaur, MK Yadav, A Bag, M Kumar – Physica status solidi (a), 2022 **Abstract**: The greatest challenge for further improving the efficiency of Cu_2ZnSnS_4 (CZTS) solar cells is the high open-circuit voltage (V_{OC}) loss owing to nonradiation interface recombination. Controlling interfacial defect states and hence eliminating interface-dominated recombination are imperative for device performance to achieve better charge extraction and collection. In this aspect, interface passivation is an effective way to resolve this issue. An ultrawide-bandgap Ga_2O_3 film is inserted between CZTS absorber and TiO_2 electron transport layer to passivate the electrically active interface trap states. The induced field-effect passivation due to the existence of an additional field of Ga_2O_3 interlayer widens the depletion region width

	and cures the interfacial defect density. The significant photoluminescence quenching observed after inserting Ga_2O_3 at the CZTS/TiO_2 heterojunction implies the effective injection of charge carriers from the CZTS absorber to TiO_2 layer owing to reduced interface defect density. Meanwhile, the substantial decrement in dark current and response time of device with passivated interface further advocates the findings. Herein, a route to understand the variation in interfacial electrical properties after inserting a thin dielectric layer at the interface is provided, which can be beneficial for the further study of CZTS-based optoelectronic device applications.
40.	Light-Mediated Aminocatalysis: The Dual-Catalytic Ability Enabling New Enantioselective Route S Roy, H Paul, I Chatterjee – European Journal of Organic Chemistry, 2022 **Abstract:** Over the last few decades, primary and secondary amines have been enormously used to trigger numerous valuable transformations. Likewise, modern-day chemistry has witnessed the potentiality of visible-light photoredox catalysis via single photoelectron transfer reactions. Recently, their synergistic effect has proved to be a crucial synthetic pillar, as several elegant protocols have their accessibility only under the cooperative action of this dual catalytic system. This catalytic system showcases a new green and sustainable synthetic approach which is advantageous from other methods. The emerging area of research demonstrates high efficiency of this dual-catalytic system to access the plethora of molecular complexity enantioselectively. Present minireview comprises several momentous developments that surfaced in the last five years in the field of photoredox-amine dual catalysis underpinning all types of synthetic transformations. By adapting the scope of each strategy, this minireview will assist and inspire further development in this thriving field.
41.	Lipid-induced monokine cyclophilin-A promotes adipose tissue dysfunction implementing insulin resistance and type 2 diabetes in zebrafish and mice models of obesity D Banerjee, D Patra, A Sinha, S Roy, R Pant… D Pal … – Cellular and Molecular Life Sciences, 2022 **Abstract**: Several studies have implicated obesity-induced macrophage–adipocyte cross-talk in adipose tissue dysfunction and insulin resistance. However, the molecular cues involved in the cross-talk of macrophage and adipocyte causing insulin resistance are currently unknown. Here, we found that a lipid-induced monokine cyclophilin-A (CyPA) significantly attenuates adipocyte functions and insulin sensitivity. Targeted inhibition of CyPA in diet-induced obese zebrafish notably reduced adipose tissue inflammation and restored adipocyte function resulting in improvement of insulin sensitivity. Silencing of macrophage CyPA or pharmacological inhibition of CyPA by TMN355 effectively restored adipocytes' functions and insulin sensitivity. Interestingly, CyPA incubation markedly increased adipocyte inflammation along with an impairment of adipogenesis, however, mutation of its cognate receptor CD147 at P309A and G310A significantly waived CyPA's effect on adipocyte inflammation and its differentiation. Mechanistically, CyPA–CD147 interaction activates NF-κB signaling which promotes adipocyte inflammation by upregulating various pro-inflammatory cytokines gene expression and attenuates adipocyte differentiation by inhibiting PPARγ and C/EBPβ expression via LZTS2-mediated downregulation of β-catenin. Moreover, inhibition of CyPA or its receptor CD147 notably restored palmitate or CyPA-induced adipose tissue dysfunctions and insulin sensitivity. All these results indicate that obesity-induced macrophage–adipocyte cross-talk involving CyPA–CD147 could be a novel target for the management of insulin resistance and type 2 diabetes.
42.	Modeling transport of extended interacting objects with drop-off phenomenon A Jain, AK Gupta – PloS ONE, 2022

	Abstract: We study a deterministic framework for important cellular transport phenomena involving a large number of interacting molecules called the excluded flow of extended interacting objects with drop-off effect (EFEIOD). This model incorporates many realistic features of biological transport process including the length of biological "particles" and the fact that they can detach along the biological 'tracks'. The flow between the consecutive sites is unidirectional and is described by a "soft" simple exclusion principle and by repelling or attracting forces between neighboring particles. We show that the model admits a unique steady-state. Furthermore, if the parameters are periodic with common period T, then the steady-state profile converge to a unique periodic solution of period T. Simulations of the EFEIOD demonstrate several non-trivial effects of the interactions on the system steady-state profile. For example, detachment rates may help in increasing the steady-state flow by alleviating traffic jams that can exist due to several reasons like bottleneck rate or interactive forces between the particles. We also analyze the special case of our model, when there are no forces exerted by neighboring particles, and called it as the ribosome flow model of extended objects with drop-off effect (RFMEOD), and study the sensitivity of its steady-state to variations in the parameters.
43.	MSRD CNN: Multi Scale Residual Deep CNN for General-Purpose Image Manipulation Detection K Rana, G Singh, P Goyal – IEEE Access, 2022 **Abstract**: The authenticity of digital images is a major concern in multimedia forensics due to the availability of advanced photo editing tools/devices. In the literature, several image forensic methods are available to detect specific image processing or editing operations. However, it remains a challenging task to design a universal forensic method that can detect multiple image editing operations. In this paper, a novel Multi-Scale Residual Deep CNN (MSRD-CNN) is designed to learn the image manipulation features adaptively for multiple image manipulation detection. Our network comprises of three stages: pre-processing, hierarchical high-level feature extraction, and classification. Firstly, a multi-scale residual module is employed in pre-processing stage to extract the prediction error or noise features adaptively. Afterwards, the obtained noise features are processed by feature extraction network having multiple Feature Extraction Blocks (FEBs) for the extraction of high-level image tampering features. Lastly, the resultant feature map is provided to the fully-connected dense layer for classification. The experiment results show that our model surpasses the existing schemes even under anti-forensic attacks, when evaluated on large-scale datasets by considering multiple image processing operations. The proposed network provides overall classification accuracies of 97.07% and 97.48% for BOSSBase and Dresden datasets, respectively.
44.	Natural Rubber Latex for Improving Ductility Characteristics of Soil: A Preliminary Experimental Investigation U Veena, N James – Geotechnical and Geological Engineering, 2022 **Abstract**: A novel concept of applying natural rubber latex (NRL) to improve the ductility characteristics of soil is addressed in this paper. A preliminary study has been conducted by analysing the load-deformation behaviour of three soils with different plasticity characteristics by performing unconfined compression strength tests. Various quantities of NRL, in liquid form, were admixed with dry soil keeping the water content of soil-NRL mix less than the optimum moisture content of that soil. Three parameters viz. deformability index, energy absorption index and brittleness index have been evaluated to quantify the ductility enhancement in NRL-treated soil. An appreciable increase has been observed in the deformability index and energy absorption index of NRL-treated soil. The brittleness index has decreased with an increase in NRL content. In addition to the ductility enhancement, even if not so significant, NRL induced an overall strength improvement of soil. The load-deformation behaviour of NRL-treated soil was compared with that of cement stabilised soil. NRL treatment results in lower strength and substantially higher ductility than cement treatment. Introductory studies on volume change characteristics, resilient modulus (M_r) and damping characteristics of NRL-treated soils are also

	presented. From the experiment results, it is recommended that NRL-treated soil can be used for ductility improvement and energy absorption. At the same time, as NRL causes a reduction in elastic modulus, it should be used in combination with any other soil strengthening admixture in scenarios where the strength of soil is a major concern.
45.	Nature-Inspired AI Techniques in Intelligent Transportation System M Mahobe, P Kumar, SS Jha – Lecture Notes in Electrical Engineering, 2022 **Abstract**: Efficient transportation is vital for smart cities. An intelligent transportation system (ITS) involves dealing with increasing travel demand, travelers' safety concerns, efficient route planning, seamless traffic management, and much more. Due to the high complexity of such problems, researchers have used nature-inspired artificial intelligence (AI) techniques to propose various solutions for an ITS. This paper provides a review of such nature-inspired AI techniques used in specific applications in four components of ITS viz., road freight transport, route planning, vehicle control system, and safety and security. Upon witnessing their ample use in various applications in these components, it is observed that these techniques are principally utilized for planning, management, forecasting, and prediction-related tasks. Further, we provide a discussion on the future scope and challenges involved in using these techniques for ITS.
46.	NCERT5K-IITRPR: A Benchmark Dataset for Non-textual Component Detection in School Books HS Kawoosa, M Singh, MM Joshi, P Goyal – International Workshop on Document Analysis Systems, 2022 **Abstract**: The STEM subjects books heavily rely on Non-textual Components (NTCs) such as charts, geometric figures, and equations to demonstrate the underlying complex concepts. However, the accessibility of STEM subjects for Blind and Visually Impaired (BVIP) students is a primary concern, especially in developing countries such as India. BVIP uses assistive technologies (ATs) like optical character recognition (OCR) and screen readers for reading/writing purposes. While parsing, such ATs skip NTCs and mainly rely on alternative texts to describe these visualization components. Integration of effective and automated document layout parsing frameworks for extracting data from non-textual components of digital documents are required with existing ATs for making these NTCs accessible. Although, the primary concern is the absence of an adequately annotated textbook dataset on which layout recognition and other vision-based frameworks can be trained. To improve the accessibility and automated parsing of such books, we introduce a new NCERT5K-IITRPR dataset of National Council of Educational Research and Training (NCERT) school books. Twenty-three annotated books covering more than 5000 pages from the eighth to twelve standards have been considered. The NCERT label objects are structurally different from the existing document layout analysis (DLA) dataset objects and contain diverse label categories. We benchmark the NCERT5K-IITRPR dataset with multiple object detection methods. A systematic analysis of detectors shows the label complexity and fine-tuning necessity of the NCERT5K-IITRPR dataset. We hope that our dataset helps in improving the accessibility of NCERT Books for BVIP students.
47.	On continuity of distribution function and decreasing rearrangement MA Bhat, GSR Kosuru – Model Assisted Statistics and Applications, 2022 **Abstract**: Given a measure space (Ω,Σ,μ), the distribution function $\mu f(v)=\mu(\{t\in\Omega:\|f(t)\|>v\})$ where $v\geqslant 0$ and the decreasing rearrangement $f^*(z)=\inf\{v\geqslant 0:\mu f(v)\leqslant z\}$, where $z\geqslant 0$ and by convention $\inf\{\emptyset\}=\infty$, of a measurable function f are known to be right continuous functions. However, these functions need not be left continuous. The purpose of this paper is to investigate the conditions under which these functions are continuous. Under the assumption that $\mu(\{t\in\Omega:\|f(t)\|>0\})<\infty$, we provide a necessary and sufficient condition for the function μf to be continuous at $v>0$. Using the same we provide a similar result for the continuity of decreasing rearrangement f^* of the function f.
48.	Pebble guided optimal treasure hunt in anonymous graphs

	B Gorain, K Mondal, H Nayak, S Pandit – Theoretical Computer Science **Abstract**: We study the problem of treasure hunt in a graph by a mobile agent. The nodes in the graph are anonymous and the edges at any node v of degree deg(v) are labeled arbitrarily as 0,1,…,deg(v)−1. A mobile agent, starting from a node, must find a stationary object, called treasure that is located on an unknown node at a distance D from its initial position. The agent finds the treasure when it reaches the node where the treasure is present. The time of treasure hunt is defined as the number of edges the agent visits before it finds the treasure. The agent does not have any prior knowledge about the graph or the position of the treasure. An Oracle, that knows the graph, the initial position of the agent, and the position of the treasure, places some pebbles on the nodes, at most one per node, of the graph to guide the agent towards the treasure. We target to answer the question: what is the fastest possible treasure hunt algorithm regardless of the number of pebbles are placed? We show an algorithm that uses O(DlogΔ) pebbles to find the treasure in a graph G in time O(DlogΔ), where Δ is the maximum degree of a node in G and D is the distance from the initial position of the agent to the treasure. We show a matching lower bound of Ω (Dlog Δ) on time of the treasure hunt using any number of pebbles.
49.	Performance of Heisenberg coupled spins as quantum Stirling heat machine near quantum critical point C Purkait, A Biswas – Physics Letters, Section A: General, Atomic and Solid State Physics, 2022 **Abstract**: We study the performance of quantum Stirling machines based on two Heisenberg-coupled spins as the working system near quantum critical point (QCP). During the heat cycle, the spins perform either as a heat engine or a refrigerator, with changing magnetic field to the critical point. At the QCP, the efficiency of the engine and the coefficient of performance of the refrigerator attain the corresponding values of their Carnot counterparts, along with maximum work output. We analyze how such enhancement can be attributed to the nonanalytic behaviour of spin-spin correlation and the entanglement near the QCP. Further, we explore how two spins perform as a thermal machine in presence of a third spin, when all the three spins are in thermodynamic equilibrium and exhibit quantum Stirling cycle.
50.	Role of precursor nuclei in heavy-ion induced reactions at low energies IM Bhat, M Shuaib, MS Asnain, MK Sharma, A Yadav, VR Sharma, PP Singh… RN Sahoo, A Sood, M Kaushik… – Physical Review C, 2022 **Abstract**: In heavy-ion induced reactions, generally, a large number of residues are populated through different reaction channels. In some cases the same residue is populated via two different modes viz., (i) directly from a given reaction and (ii) via β and/or electron capture decay of a nuclide (precursor). Separation of the two is required for a better understanding of reaction dynamics. The procedure existing in the literature for extracting the independent production cross section from the cumulative cross section employs the assumptions of half-life of the daughter being much larger in comparison to the half-life of the precursor ($t_{p1/2} \ll t_{d1/2}$) and require the counting to be performed after large cooling times ($t_l \to \infty$). A general and more exact expression is obtained in the present work surpassing the assumptions as well as difficulties reported earlier. Analysis of the experimental reaction data sets covering a broader range of possibilities ($t_{p1/2} > t_{d1/2}$; $t_{p1/2} \approx t_{d1/2}$; $t_{p1/2} < t_{d1/2}$) presented shows the importance of the current formulations. The advantage of the generalized expression even when the assumptions hold true is also discussed. A comparison of results obtained from the traditional method in the context of its assumptions instead of the calculations from the exact expression has been made. The results obtained with the presently derived formulations are found to give justified values of cross sections for all the cases in contrast to the traditional formulation.
51.	SARS-CoV-2 vaccines: Clinical endpoints and psychological perspectives: A literature review

	JA Malik, M Aroosa, S Ahmed … – Journal of Infection and Public Health, 2022 **Abstract**: Background: About 270 million cases have been confirmed, and 5.3 million fatalities Worldwide due to SARS-CoV-2. Several vaccine candidates have entered phase 3 of the clinical trial and are being investigated to provide immunity to the maximum percentage of people. A safe and effective vaccine is required to tackle the current COVID-19 waves. There have been reports that clinical endpoints and psychological parameters are necessary to consider vaccine efficacy. This review examines the clinical endpoints required for a successful SARS-CoV-2 vaccine and the influences of psychological parameters on its efficacy. Methods: The main research question was to find out the clinical endpoints that determine the vaccine efficacy? And what kind of psychological parameters affect the vaccine efficacy? The information was taken from several journals, databases, and scientific search engines like Googe scholar, Pubmed, Scopus, Web of Science, Science direct, WHO website, and other various sites. The research studies were searched using keywords; SAR-CoV-2 vaccine efficacy, psychological effect on SARS-CoV-2 vaccine, SARS-CoV-2 vaccine endpoints. Results: This review has highlighted various clinical endpoints that are the main determinants of clinical vaccine efficacy. Currently, vaccinations are being carried out throughout the world; it is important to investigate the main determinants affecting vaccine efficacy. We have focused on the clinical endpoints and the influence of psychological parameters that affect the vaccine efficacy in clinical settings. The primary endpoints include the risk of infection, symptoms, and severity of COVID-19, while hospitalization length, supplemental oxygen requirement, and mechanical ventilation are secondary endpoints in the clinical endpoints. Some tangential endpoints were also considered, including organ dysfunction, stroke, and MI. Many psychological associated things have influenced the vaccine efficacy, like the lower antibody titers in the vaccinated people. In addition to that, Short- and long-term stress and sleep deprivation were also found to affect the vaccine efficacy. Conclusion: The review summarizes the important clinical endpoints required for a successful vaccine candidate. In addition to primary and secondary endpoints, auxiliary endpoints and the disease burden also play an important role in modulating vaccine efficacy. Moreover, the psychological perspective also influences vaccine efficacy. Effective follow-up of participants should follow to examine the clinical endpoints to reach any conclusion about vaccine efficacy.
52.	Single point incremental bending: Bending load evaluations and process validation A Singh, A Agrawal – Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, 2022 **Abstract**: Sheet metal or monolithic thin structured components with complex freeform geometries are used in wide range of applications in aerospace, marine and automobile sectors. Fabrication of such complicated geometries and profiles generally requires complex manufacturing setup (dies, jigs and punches) resulting in process inflexibility, in addition to huge tooling and equipment costs. In the present work, a novel process ‘single point incremental bending’ (SPIB) is proposed. In principle, it is similar to single point incremental forming process. SPIB is a die less bending operation where a solid hemispherical shaped single point tool is used to locally bend the sheet metal to a desired shape incrementally using a computer numeric controlled setup or certain robotic platforms. In addition to that, an experimental and finite element analysis based numerical study on the bending load patterns and trends in single point incremental sheet metal bending has been presented. Detailed investigation of various commercial sheet metals and various parametric effects on bending load is also performed. The influence of sheet material, material anisotropy and four major process parameters – sheet thickness, tool diameter, incremental bending angle and sheet height to length ratio on the bending loads is investigated.
53.	Spinel-based catalysts for the biomass valorisation of platform molecules *via* oxidative and reductive transformations

	JH Advani, GS More, R Srivastava – Green Chemistry, 2022 **Abstract**: The heterogeneous catalytic valorisation of renewable lignocellulosic biomass for platform and/or value-added chemicals is an efficient strategy from green and sustainable chemistry perspectives. Biorefineries largely rely on utilizing acid catalysts and hydrogenation/oxidation reactions. Metal oxides have been extensively utilized as solid acid catalysts in these transformations. Among these metal oxides, spinels can be identified as high potential catalysts due to the possibility of fine-tuning the metals in the framework, consequently modifying the structural (acidity and basicity), physical (surface area and porosity), optical, and electronic properties, and high thermal stability giving rise to greener catalytic reactions. Spinels are eco-friendly heterogeneous catalysts that are easily separable (either magnetically separable or just by simple filtration) and recyclable, and fulfil the criteria of green chemistry principles. This review presents advancements in spinel and spinel-based catalysts (*in situ* generated active spinels from metal oxides) for the catalytic hydrogenation and oxidation of biomass-derived platform molecules to produce value-added fuels and chemicals. Also, the structural properties of these catalysts have been correlated with the catalytic performance to explore the bottlenecks in this area. The challenges and future opportunities in spinel-assisted biomass transformations are also discussed.
54.	State of the art review on the sustainable dry machining of advanced materials for multifaceted engineering applications: Progressive advancements and directions for future prospects J Singh, SS Gill, M Dogra, R Singh, M Singh, S Sharma… – Materials Research Express, 2022 **Abstract**: In this article, the comprehensive review on the application, and indeed, a comparative analysis on dry machining of different types of materials (Inconel, steel, aluminum, cast iron, magnesium and advanced materials) used in machining (turning, drilling and milling operations) were carried out in the light of utmost works published in the literature. The work describes the scientific findings of the past twenty years, including sustainable methods (surface texture, solid lubricants, vibration-assisted machining, laser-assisted machining), tool coatings, and geometry of tools. Vibration-assisted machining is another direction that researchers have investigated without the use of cutting coolants, where the complete disposal of coolants is not possible. Various researchers have carried out rigorous experimental work on milling, drilling, and turning operations under dry conditions to machine numerous materials. A significant proportion of experimental data about tool wear, tool wear machining, surface quality, surface integrity, etc., has been analyzed under dry conditions. However, the critical analysis of dry machining for different conventional machining operations for a variety of industrial materials is still lacking for establishing dry machining as a sustainable process for industrial applications. Thus, the critical analysis of various machining parameters and their consequences on tool wear and the surface quality of machined work was carried out in this work. Finally, scientific recommendations based on critical findings were proposed for industrial implementation of dry machining.
55.	Structural and Vibrational Response of Artificial Spider Webs with Different Spacing J Jyoti, A Kumar, P Lakhani, M Sandhu, BP Singh, N Kumar – Journal of Vibration Engineering & Technologies, 2022 **Abstract**: Introduction The threads of spider web are of significant interest to the science and technology due to their extraordinary mechanical and vibrational properties. The transmitting vibrational information to the spider plays a significant role in structural properties. The main objective of this work is to construct artificial webs with three different spacing (between spiral to spiral) i.e., 15 mm, 20 mm, and 25 mm which have been used to mimic the properties of the natural spider web. Materials and Methods

	The vibrational response of the artificial threads was measured using the laser Doppler vibrometry (LDV) and digital image correlation technique. Mode shape was also calculated. The decomposition of the mode shape provided information about the damage structure of the web. The center of the web was excited with air blow which mimicked the natural wind flow. The excited spider web was analyzed for their natural frequency. Result and Discussion Natural frequency, damping ratio, vibrational signal and mode shapes were investigated extensively to analyze full and damage web characteristics. The firstorder natural frequency at the center of the web was determined in the experiment and observed as 3.70 Hz (spacing between spiral to spiral is 15 mm), 3.25 Hz (20 mm) and 1.73 Hz (25 mm) at different spacing. Damping ratio, transmissibility, mode shape, vibrational properties of the threads within webs were significantly affected by the spacing within spirals in the web. Using the finite analysis, we recorded the stress distribution within the full and damaged webs. The 25 mm spacing between the threads was of more displacement as compared to 15 mm. Structural features of the web significantly improve its vibrational properties. The damage radials threads tend to have a significant effect on the structural vibrational response of the full spider web. Conclusions This study will be helpful for the structural engineering applications to adapt the concept of spider webs and their properties and damage patterns for larger applications. The different spacing models of webs not only support in understanding the optimal mechanisms of spider webs, but also provide signs for designing anti-impact structures and wireless sensor.
56.	Structures, stabilities, optoelectronic and photocatalytic properties of Janus aluminium mono-chalcogenides Al(Ga, In)STe monolayers S Bahti, M Kibbou, N Khossossi, A Ainane, R Ahuja … – Physica E: Low-Dimensional Systems and Nanostructures, 2022 **Abstract**: Computational design of new two-dimensional materials constitutes an effective and promising approach in the development and exploration of a wide range of emerging applications such as optoelectronics, photocatalysis, energy storage, and conversion. Within the framework of this work, we systematically investigated for the first time, the structural, stability, optoelectronic, and pho-tocatalytic properties of new predicted Al(Ga, In)STe monolayers derived from Janus Aluminium mono-chalcogenides through Density Functional Theory and Ab-Initio molecular dynamic simulations. After a full optimization of both struc-tures, their dynamics and thermal stability was confirmed through the calculations of phonon spectrum and ab-initio molecular dynamics at a chosen temperature, respectively. Subsequently, the electronic and optical properties were explored and findings revealed that both monolayers exhibit a semiconducting characteristic with a direct and indirect electronic band gap of about 2.23 and 2.69 eV using HSE06 hybrid functional for AlGaSTe and AlInSTe monolayers, re-spectively. Furthermore, the optical absorption indicates a strong absorption of light in the range between 3 and 18 eV. More noticeably, Both Janus monolayers considered exhibiting a promising optical absorption in the visible wavelength region with an absorption coefficient greater than 10^5 cm^{-1}. In addition, the photocatalytic properties of these structures were investigated by plotting the band edge positions straddle the reduction potential of H_2 and the oxidation potential H_2O. Based on our results, we conclude that both monolayers offer good thermodynamic stability allowing them to be processed experimentally and can be used as very appropriate candidates for optoelectronics and photocatalytic applications.
57.	Synergistic effect of ultrasonic vibration and laser energy during hybrid turning operation in magnesium alloy N Deswal, R Kant – The International Journal of Advanced Manufacturing Technology, 2022

	Abstract: This article proposes a hybrid turning process that simultaneously exploits the synergy of ultrasonic vibration and laser energy on a single machine tool. The developed process combines the features of ultrasonic vibration-assisted turning (UVAT) and laser-assisted turning (LAT) into a new hybrid turning process, i.e., ultrasonic vibration laser-assisted turning (UVLAT). In this study, the details of the UVLAT process are presented, and an experimental investigation is carried out to analyze the machining performance of magnesium AZ31B alloy during UVLAT and compared with conventional turning (CT), UVAT, and LAT. The analysis shows that low machining forces, high machining temperature, low tool wear, ductile chips, low surface roughness, fine grain microstructure, and high microhardness are obtained during UVLAT in comparison to CT, UVAT, and LAT. Machining forces and surface roughness are increased with an increase in cutting speed, whereas machining temperature and cracks on chip surfaces are reduced. Furthermore, machining forces, cracks on chip surface, surface roughness, and grain structure are decreased with an increase in laser power and vice versa for machining temperature and microhardness. However, insignificant variation in tool wear is observed with increased cutting speed and laser power. Additionally, scanning electron microscope (SEM) analysis shows negligible irregularities on the machined surface for UVLAT. Energy-dispersive X-ray spectroscopy (EDS) analysis shows no variation in elemental composition for tool face and machined surface among various processes. Results demonstrated that the UVLAT process has an excellent potential to enhance the machining performance of magnesium alloys and is better than CT, UVAT, and LAT.
58.	Synthesis and characterization of (Al-20Cu-8Si-3Sn) low temperature brazing alloy via powder metallurgy route S Chand, A Gaur, K Rakha, U Batra – Materials Today: Proceedings, 2022 **Abstract**: The effect of the Cu, Si & Sn on the melting temperature point of the Al-based brazing filler alloy has been investigated. Amount of the elements used in the alloy taken in the following percentages 20 wt% Cu, 8 wt% Si, 3 wt% Sn and balance is Al in every 50 gm sample. The alloy has been prepared using the pure powder of all the elements using ball milling method at various milling time and fixing all other parameters as constant. XRD patterns show the various phases developed such as Al_2Cu and $Cu_{10}Sn_3$ after the compaction & sintering. XRD & FESEM images show the variation in the particle size of Al-Cu-Si-Sn milled powder at different milling time. FESEM data has been analyzed of the Al-Cu-Si-Sn alloy both before and after sintering followed by EDX which is used to investigate the phases and to confirm the presence of the various elements in the alloy. DSC results show the melting temperature of all the samples and it has been found that there is no significant effect of the milling time on the melting temperature at same alloy composition. The melting temperature that has been achieved of Al-20Cu-8Si-3Sn is 530.4 °C.
59.	Synthesis and characterization of $CoCrFeNi_{1.75-x}Ti_{0.25+x}$ high entropy alloy S Chand, NK Rana, K Rakha, S Reza, U Batra – Materials Today: Proceedings, 2022 **Abstract**: High entropy alloys are part of a novel area of metallurgy concerning alloys containing at least five elements with an atomic percentage ranging from 5 at% to 35 at%. The interest arises as for plenty of compositions, the formation of simple solid solutions gives rise to promising properties, pertaining their use in different fields such as structural, nuclear, automotive and aerospace industries. The main objective of this study was to synthesize $CoCrFeNi_{1.75-x}Ti_{0.25+x}$(x = 0, 0.05, 0.15, 0.25) non-equiatomic, single-phase, high entropy alloys (HEAs) based on the multi-component Co-Cr-Fe-Ni-Ti system were produced by melting route in vacuum arc furnace. The characterization of newly developed HEAs was carried out using X-Ray Diffraction (XRD) and Optical Microscopy. XRD and optical microscopy confirmed the formation of single phase Ni(CoCrFeTi) FCC alloys system and dendritic structure respectively. Electrochemical workstation was used to test the corrosion behaviour of newly developed High entropy alloys in 3.5 wt% NaCl and 0.5 M H_2SO_4 aqueous solution at room temperature. The corrosion current density (I_{corr}) of the alloys decreased with the increase of Ti content. When the

	Ti content increased from 5 at% to 10 at% the value of (I_{corr}) decreased from 0.423μA to 0.270 μA in 3.5 wt% NaCl and from 21.42 μA to 16.84 μA in 0.5 M H_2SO_4 aqueous solution respectively.
60.	TEMPSENSE: LoRa Enabled Integrated Sensing and Localization Solution for Water Quality Monitoring LK Baghel, S Gautam, VK Malav, S Kumar – IEEE Transactions on Instrumentation and Measurement, 2022 **Abstract**: With the continuous increase in water pollution, water quality monitoring has become quite essential. Though existing solutions facilitate various features [e.g., the potential of hydrogen (pH), dissolved oxygen (DO), temperature, and electrical conductivity (EC)], they possess numerous limitations: 1) most of the existing systems rely on regional wireless systems, e.g., global system for mobile communication (GSM) and a global positioning system (GPS); hence, their performance varies with local connectivity and 2) usually, the setup is deployed at remote locations, including river site, so the solutions need to be power-optimized and should be able to support self-localization ability, which lacks the existing solutions. In this context, we have developed a cost-effective functionality integration that brings different sensors, processing units, and Long Range (LoRa) transmission to a single platform, providing a compact, power-efficient, and low-cost Total dissolved solids (TDS), Ec, teMperature, pH monitoring SystEm with integrated localizatioN Solution (TEMPSENSE). The proposed TEMPSENSE hardware is equipped with interactive sensing and localization algorithms that address the abovementioned concerns and facilitate the real-time location along with the required water quality parameters. Also, the proposed system has been thoroughly investigated by designing the hardware at the institution's laboratory. Furthermore, it is shown that the proposed hardware is several times cheaper than the available industrial solutions. Moreover, a number of experiments on different types of solutions have been performed for validation of the proposed design. Furthermore, extensive experiments have been performed for localization in low- and high-density scenarios and are found that the proposed algorithm is potentially able to estimate the real-time location of the TEMPSENSE.
61.	The assessment of reflectance ratios for determination of water content in leaves using shorter end of near-infrared spectroscopy S Bharadwaj, R Kumar – Biomedical Spectroscopy, Microscopy, and Imaging II, 2022 **Abstract**: Leaf water content is essential to measure the growth of plants and estimate the risk of drought or forest fire. Scientists have shifted their attention from conventional methods to spectroscopic techniques, as they can provide real-time water monitoring in plants from a remote accessed station. In the study, data were acquired from oven-dried leaves at various stages of heating. The correlogram between reflectance intensity and equivalent water thickness against wavelengths was used to identify the suitable wavelengths and associated reflectance ratios for further assessment of water content in the leaf. Based on the nature of acquired data, exponential and bi-exponential models were applied to relatively evaluate the optimal reflectance ratios for the determination of water content in leaves. Moreover, the results were compared with the water index (WI) reflectance ratio (R900/R970) and the three-band ratio index (RATIO975). The WI reflectance ratio is typically used as a standard estimator of water content in plants while RATIO975 is another suitable three-band ratio centered at 975 nm gaining wide acceptance. The observation in the study might be useful in finding the optimal indices for the qualitative assessment of leaf water content within the shorter range (600-1100 nm) of near-infrared spectroscopy.
62.	The synergistic influence of lemon extract on the physio-chemical properties of Kibisu silk reinforced wheat gluten biocomposite P Bhowmik, R Kant, R Nair, H Singh – Polymer Bulletin, 2022

	Abstract: Plastic waste has become a pervasive and global threat to every ecosystem, and the continuous surge in plastic production has triggered the need for sustainable alternatives. This study focuses on harnessing a hundred percent biodegradable composite sheets with a natural crosslinker, which can be used in several end applications like seedling trays, gardening pots, sampling trays, one-time plates, ear and nasal swabs, etc. The proposed composite is manufactured with all-natural ingredients and zero harmful chemicals. The waste Kibisu silk or filature silk fibre (*Bombyx mori*) is used here as the fibre reinforcement, and wheat gluten (WG) is used as the matrix material. For plasticising and crosslinking the WG, castor oil and fresh lemon extract (*Citrus limon*) are used. In addition, pellets of sodium hydroxide are also added as a dispersion agent for WG. All the significant constituents used here are industrial waste or abundantly available in nature. The properties obtained from the characterisation processes indicate that natural crosslinker adds better physio-chemical properties in the developed samples.
63.	TM dopant-induced H-vacancy diffusion kinetics of sodium-lithium alanates: Ab initio study for hydrogen storage improvement P Pluengphon, P Tsuppayakorn-aek, W Sukmas, R Ahuja … – International Journal of Hydrogen Energy, 2022 **Abstract**: We present a hydrogen storage mechanism of the surface and bulk Na–Li–Al hydrides substituted by the transition metal (TM) dopants such as Ni, Cu, Ag, and Zn. The host hydrides of interest, namely, $NaAlH_4$, $LiAlH_4$, Na_3AlH_4, Li_3AlH_4, and Na_2LiAlH_4 are found to be stable compositions at ambient pressure. Hydrogen vacancy mechanisms of the host hydrides with the TM dopants are investigated using ab initio calculations. Remarkably, the results show the enhancement of the internal mechanism for hydrogen storage in the Na–Li–Al complex hydrides. Doping of Ni or Zn mainly reduces the energy barrier of diffusion kinetics in the host Na–Li–Al hydrides, leading to the improvement of the hydrogen storage efficiency of the host Na–Li–Al hydrides. Therefore, hydrogen vacancy diffusion kinetics in the Na–Li–Al hydrides can be induced by adding the Ni and Zn dopants.
64.	Towards Reducing Aleatoric Uncertainty for Medical Imaging Tasks AS Sambyal, NC Krishnan, DR Bathula – Proceedings - International Symposium on Biomedical Imaging, 2022 **Abstract**: In safety-critical applications like medical diagnosis, certainty associated with a model's prediction is just as important as its accuracy. Consequently, uncertainty estimation and reduction play a crucial role. Uncertainty in predictions can be attributed to noise or randomness in data (aleatoric) and incorrect model inferences (epistemic). While model uncertainty can be reduced with more data or bigger models, aleatoric uncertainty is more intricate. This work proposes a novel approach that interprets data uncertainty estimated from a self-supervised task as noise inherent to the data and utilizes it to reduce aleatoric uncertainty in another task related to the same dataset via data augmentation. The proposed method was evaluated on a benchmark medical imaging dataset with image reconstruction as the self-supervised task and segmentation as the image analysis task. Our findings demonstrate the effectiveness of the proposed approach in significantly reducing the aleatoric uncertainty in the image segmentation task while achieving better or on-par performance compared to the standard augmentation techniques.
65.	Twitter sentiment analysis for COVID-19 associated mucormycosis M Singh, HK Dhillon, P Ichhpujani, S Iyengar, R Kaur – Indian Journal of Ophthalmology, 2022 **Abstract**: Purpose: COVID-19-associated mucormycosis (CAM) was a serious public health problem during the second wave of COVID-19 in India. We planned to analyze public perceptions by sentiment analysis of Twitter data regarding CAM.

	Methods: In this observational study, the application programming interface (API) provided by the Twitter platform was used for extracting real-time conversations by using keywords related to mucormycosis (colloquially known as “black fungus”), from May 3 to August 29, 2021. Lexicon-based sentiment analysis of the tweets was done using the Vader sentiment analysis tool. To identify the overall sentiment of a user on any given topic, an algorithm to label a user “k” based on their sentiments was used. Results: A total of 4,01,037 tweets were collected between May 3 and August 29, 2021, and the peak frequency of 1,60,000 tweets was observed from May 17 to May 23, 2021. Positive sentiment tweets constituted a larger share as compared to negative sentiment tweets, with weekly variations. A temporal analysis of the demand for utilities showed that the demand was high in the initial period but decreased with time, which was associated with the availability of resources. Conclusion: Sentiment analysis using Twitter data revealed that social media platforms are gaining popularity to express one’s emotions during the ongoing COVID-19 pandemic. In our study, time-based assessment of tweets showed a reduction over time in the frequency of negative sentiment tweets. The polarization in the retweet network of users, based on sentiment polarity, showed that the users were well connected, highlighting the fact that such issues bond our society rather than segregating it.
66.	Vacuum polarization of Dirac fermions in the cosmological de Sitter global monopole spacetime MS Ali, S Bhattacharya – Physical Review D, 2022 **Abstract**: We study the vacuum polarization effects of the Dirac fermionic field induced by a pointlike global monopole located in the cosmological de Sitter spacetime. First we derive the four orthonormal Dirac modes in this background in a closed form. Quantizing the field using these modes, we then compute the fermionic condensate, $0\|\bar{\psi}\psi\|0$, as well as the vacuum expectation value of the energy-momentum tensor for a massive Dirac field, regularized in a particular way. We have used the Abel-Plana summation formula in order to extract the global monopole contribution to these quantities and have investigated their variations numerically with respect to relevant parameters.
67.	Variations in writhes of virtual knots under a local move A Gill, P Madeti – Bulletin of the Korean Mathematical Society, 2022 **Abstract**: n-writhes denoted by $J_n(K)$ are virtual knot invariants for $n \neq 0$ and are closely associated with coefficients of some polynomial invariants of virtual knots. In this work, we investigate the variations of $J_n(K)$ under arc shift move and conclude that n-writhes $J_n(K)$ vary randomly in the sense that it may change by any random integer value under one arc shift move. Also, for each $n \neq 0$ we provide an infinite family of virtual knots which can be distinguished by n-writhes $J_n(K)$, whereas odd writhe $J(K)$ fails to do so.

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