Sl. No.	IIT Ropar List of Recent Publications with Abstract Coverage: March, 2020
1.	A DEMATEL Approach to Evaluate the Enablers for Effective Implementation of Ecodesign in Sustainable Product Development: A Case of MSMEs SP Kumar, S Prabir - Innovative Product Design and Intelligent Manufacturing Systems, 2020 **Abstract:** Increasing pressure of producing environmentally friendly products and services has forced companies to adopt ecodesign practices in their production process, especially in micro, small and medium enterprises (MSMEs). These practices help the designers to mitigate the environmental issues such as climate change and depleting natural resources by designing sustainable products. There are certain enablers that need to be realized by companies for effective implementation of eco-friendly practices. The main focus of this research is to identify and evaluate the key enablers for sustainable product development. A Decision Making Trial and Evaluation Laboratory (DEMATEL) approach is used in this study to evaluate the identified enablers. A case study based on an Indian manufacturing MSME is carried out to present the real-life applicability of the proposed study. The findings of this study show that training of designers to use various available ecodesign methods and tools is the most important enabler that can have a significant effect in the implementation of ecodesign practices for sustainable product development.
2.	A Novel Forest Fire Detection System Using Fuzzy Entropy Optimized Thresholding and STN-based CNN SB Avula, SJ Badri, G Reddy - International Conference on COMmunication Systems & NETworkS, 2020 **Abstract:** In this paper, a video processing based forest fire and smoke detection using a Fuzzy Entropy optimized thresholding and convolutional neural network (CNN) based model is proposed. In our proposed architecture adopts and introduces a spatial transformer network (STN) in the CNN layer and entropy function thresholding operation in the softmax layer due to addition in the softmax layer it works excellently and accurately. We have taken initial preprocessing video quality as an essential issue, which helps us in providing less false alarm rate, we checked the blockiness, blurriness, noisiness and used efficient ways to enrich the quality of the video. After preprocessing, we propose the Three Frame Difference Method to calculate the motion of all frames. During feature extraction, we suggest an STN-Based CNN extract the dynamic features of an image. After extraction, we need to perform the classification step, and here we introduce the entropy function thresholding method in the softmax layer. The results obtained with our proposed architecture were compared with the existing methods in the literature and showed a higher exact fire detection rate, a very less false detection rate, good accuracy, and less execution time in terms of complexity. The proposed method can be used efficiently for real-time forest fire detection with a moving camera.
3.	Additional repulsion reduces the dynamical resilience in the damaged networks BK Bera - Chaos: An Interdisciplinary Journal of Nonlinear Science, 2020 **Abstract:** In this paper, we investigate the dynamical robustness of diffusively coupled oscillatory networks under the influence of an additional repulsive link. Such a dynamical resilience property is realized through the aging process of the damaged network of active and inactive oscillators. The aging process is one type of phase transition, mainly appearing at a critical threshold of a fraction of the inactive oscillator node where the mean oscillation amplitude of the entire network suddenly vanishes. These critical fractions of the failure nodes in

	the network are broadly used as a measure of network resilience. Here, we analytically derived the critical fraction of the aging process in the dynamical network. We find that the addition of the repulsive link enhances the critical threshold of the aging transition of diffusively coupled oscillators, which indicated that the dynamical robustness of the coupled network decreases with the presence of the repulsive interaction. Furthermore, we investigate the dynamical robustness of the network against the number of deteriorating repulsive links. We observed that a certain percentage of the repulsive link is enabled to produce the aging process in the entire network. Finally, the effect of symmetry-breaking coupling and the targeted inactivation process on the dynamical robustness property of damaged networks were investigated. The analytically obtained results are verified numerically in the network of coupled Stuart–Landau oscillators. These findings may help us to better understand the role of the coupling mechanism on the phase transition in the damaged network. The degradation of dynamical behavior in the coupled dynamical networks naturally arises due to some external perturbation on their local dynamics as well as their coupling patterns. Such dynamical deterioration can impact the network's natural performances. Even a failure of a single unit in the interacting complex systems may lead to the massive collapse of the whole system. Many real-world networks are composed of entities that are affiliated with some intestinal dynamical properties, and this dynamical activity is the main prerequisite criterion for the network's normal functions. In the present work, we studied such a dynamical tolerance property of the coupled dynamical network in the presence of both diffusive and repulsive interactions. Here, the dynamical resilience property of the entire network is characterized through one type of phase transition, namely, the aging transition (AT) of the damaged network. The critical phase transition points are analytically derived in the globally coupled network. Then, we extend our investigation into the scale-free networks (heterogeneous networks). The dynamical robustness property has also been investigated under the influences of the preferential inactivation procedure and the effect of the symmetry-breaking coupling functions. Finally, we calculate the critical fraction of the repulsive link for the appearance of aging processes. The analytical findings are validated through numerical results.
4.	An Appliance Load Disaggregation Scheme Using Automatic State Detection Enabled Enhanced Integer-Programming S Dash, R Sodhi, B Sodhi - IEEE Transactions on Industrial Informatics, 2020 **Abstract:** Measuring the power consumption of individual household appliance is an essential task for home energy management and demand response programmes. To this end, this paper proposes a simple yet effective, two-stage non-intrusive appliance load monitoring (NILM) scheme. A standard deviation based automatic state detection (ASD) algorithm is developed in stage-1, which results in the information about states and the transient spans of individual appliances. In stage-2 of the proposal, a penalty based enhanced integer programming (IP) based load disaggregation method is proposed. The efficacy of the proposed method is initially verified with the Reference Energy Disaggregation Data (REDD) dataset, and then tested on an actual residential house. Various test results reveal that the proposed enhanced IP based method is an effective and less complex solution to load disaggregation problem.
5.	Analytical model for homocharge accumulation in LDPE—role of conduction, injection and diffusion AK Upadhyay, CC Reddy - IEEE Transactions on Dielectrics and Electrical Insulation, 2020 **Abstract:** Homocharge, particularly, positive charge near anode has been observed inside low-density polyethylene (LDPE) by many researchers. However, the phenomenon is yet to be understood theoretically and mathematical analysis is pending, although, simulations have been reported. Simulation of evolution of space charge in LDPE, with time and space, using bipolar charge transport model considered only drift component of charge carriers inside the dielectric. The experimental results suggest significant concentration gradient in space charge distribution. The authors derived a comprehensive drift and diffusion based analytical models, for the

	time/space evolution of space charge and electric field in dielectrics using Maxwell's equations, current continuity equation, conduction and injection mechanisms. The proposed analytic models of electric field and space charge distribution entwines charge injection at electrodes and charge transport inside the medium, which seem to have not been reported until now. Remarkable, believed to be unprecedented, agreement between the analytical and experimental results has been observed. Using the model, the role of conduction, injection, diffusion on homocharge accumulation has been investigated. Pulsed electroacoustic method is used for the measurements of the space charge dynamics.
6.	Antibacterial Polymeric and Peptide Gels/Hydrogels to Prevent Biomaterial-Related Infections K Malhotra, Y Singh - Racing for the Surface, 2020 **Abstract:** The emerging threat of antibiotic resistance in pathogenic microbes is a menace to public health. The situation is equally alarming so far as biomaterial-related infections resulting from implantation are concerned. Antibiotics were considered effective in treating bacterial infections and saved millions of lives from infection but the repeated use of antibiotics has led to the development of resistance in microbes. Several strategies have been developed to address the challenge of antibiotic resistance in bacteria. Examples include the use of antiseptics, antiadhesives, metal ions and nanoparticles, carbon nanotubes, graphene and graphene oxide, antimicrobial peptides, and antimicrobial polymers. Even though these approaches offer varying degree of success, they are also associated with serious limitations. Consequently, scientists have focused their efforts toward the development of self-assembled peptide and polymeric gels/hydrogels, as antibacterial biomaterials, to address the challenge of antibiotic resistance in bacteria. This chapter provides a critical review of the developments in the field of antibacterial self-assembled peptides and polymeric gels/hydrogels for treating biomaterial-related infections.
7.	Crack Growth Simulation in Quasi-brittle Materials Using a Localizing Gradient Damage Model A Negi, S Kumar - Advances in Fluid Mechanics and Solid Mechanics, 2020 **Abstract:** Failure in quasi-brittle materials comes under an intermediate category of fracture failure, which includes different stages, i.e., micro-cracks nucleation, growth, and coalescence into a macroscopic crack. The different stages of failure result in a tension-softening structural response, which can be accurately modeled using the conventional gradient damage models. However, due to a constant interacting domain throughout the load history, conventional gradient damage models suffer from various drawbacks which limits their application to simulate the final stages of quasi-brittle failure process. In this contribution, the present work illustrates a thermodynamically consistent localizing gradient damage model, which successfully overcomes the drawbacks of conventional gradient damage models. The localizing gradient damage model uses an interaction function definition in the constitutive framework to take into account the diminishing nonlocal interactions, thus attaining a macroscopic crack in the form of a localized damage profile during the last stages of failure. The numerical accuracy of the model is tested against both mode-I and mode-II types of failure problems and compared with the experimental results.
8.	Design and synthesis of a novel coumarin-based framework as a potential chemomarker of a neurotoxic insecticide, azamethiphos AKK Bhasin, P Raj, P Chauhan, SK Mandal…N Singh… - New Journal of Chemistry, 2020 **Abstract:** Selective affinity of a novel coumarin-functionalized fluorescent sensor, 8-((*E*)-((thiophen-2-yl)methylimino)methyl)-7-hydroxy-4-methyl-2*H*-chromen-2-one (L), to copper(II) ions *via* fluorescence quenching in HEPES buffer at pH 7.4 has been demonstrated. This coordination chemistry between the coumarin-based ligand L and copper(II) ions has been subsequently exploited for the generation of a unique chemical ensemble, $L{\cdot}Cu^{2+}$, which qualifies the former as a sensitive and selective fluorogenic sensor for the toxic organophosphate

	pesticide azamethiphos in aqueous medium. The sequestering of the native fluorescence of receptor probe L upon entrapment of copper(II) within the former was altered upon sequential administration of azamethiphos into the environment of the host complex, $L{\cdot}Cu^{2+}$. The physico-chemical interactions between the sensor complex $L{\cdot}Cu^{2+}$ and azamethiphos, as corroborated by ^{31}P NMR studies and fluorescence spectroscopy, serve as the basis for ideal chemical discrimination of azamethiphos, amongst a pool of several ecotoxic organophosphate pesticides.
9.	Detoxification and Sensing of Organophosphate-Based Pesticides and Preservatives in Beverages A Singh, P Raj, N Kaur, N Singh - Preservatives and Preservation Approaches in Beverages, 2019 **Abstract:** Development of new catalytic materials for degradation of organophosphates and sensing is an active area of research. To feed the growing population in the word, the load on the agriculture sector increases, which promotes the superfluous use of pesticides. Generally, such kinds of pesticides did not degrade even after a long time and caused a serious health issue. The mostly used pesticides are organophosphate or carbamate-based organic compounds. These are one of the most toxic chemicals known to humans. Both of these elicit their toxic action through the blockade of the acetylcholinesterase enzyme that hydrolyzes acetylcholine into choline, which plays a key role in the peripheral cholinergic system, and intoxication of these pesticides may cause death. Therefore, to ensure quality control in beverages, biocompatible sensors are needed. It is very difficult to separate pesticides from natural beverages in industry. Hence, the target should be decontamination of these pesticides using highly biocompatible catalysts that do not of themselves toxify the beverages. In the last decades, many catalysts have been developed for sensing and degradation of organophosphates. The current chapter is focused on biocompatible catalysts that specifically degrade organophosphate contamination in natural beverages. The major emphasis is given to recent advances in metal complex-based biocompatible catalysts that are well known for phosphate ester hydrolysis and oxime-based green catalysts as decontamination agents for organophosphates.
10.	Effect of substrate surface roughness on properties of cold-sprayed copper coatings on SS316L steel S Singh, H Singh, S Chaudhary, RK Buddu - Surface and Coatings Technology, 2020 **Abstract:** The development of thick pure copper coatings on SS316 substrates with desired properties for Tokamaks is still a challenging task. The solution to this task can help to fulfill the demanding requirements of in-vessel materials for plasma passivation. In the present work, the effect of substrate surface roughness on several properties of cold-sprayed copper coatings was investigated. Effect of post-heat-treatment on the properties of the developed coatings was also studied. The developed coatings were characterized using various techniques *viz.*; scanning electron microscopy/energy dispersive spectroscopy, X-ray diffraction, optical microscopy, microhardness, nanoindentation, electrical and thermal conductivity measurements, and density and porosity analyses. The novelty of the article includes *in-situ* micro-tensile testing of the developed coatings to understand their fracture mechanism, which showed multi-crack failure. Moreover, the cracks were found to be originating from the multi-splat boundary junctions, followed by growth along the splat boundaries. Additionally, γ-rays and heavy-nuclei irradiation along with thermal cyclic exposure studies were also performed to elucidate the actual environmental performance of the coatings. The coatings developed on the mirror-finished surface were found to have better mechanical and physical properties as compared to the coatings developed on the rough substrate surface; prior as-well-as post-heat-treatment.
11.	Hydrogen trapping potential of Ca decorated metal-graphyne framework S Kumar, TJD Kumar - Energy, 2020 **Abstract:** Hydrogen holds the promise for alternative clean energy carrier due to its renewable

	and pollution free nature. A metal-organic framework (MOF) is designed with graphyne linker. Each graphyne linker is decorated with two Ca atoms across the linker with average metal binding energy 3.0 eV. The structural, electronic and hydrogen storage properties of Ca decorated MOF have been explored by using first principle calculations. On full saturation with hydrogen, each Ca atom of MOF-Ca_8 adsorbs a maximum of six H_2 molecules and results in MOF-Ca_8-$48H_2$ structure. Further twelve more hydrogen molecules could be accommodated in the pore space of MOF resulting in the MOF-Ca_8-$60H_2$ structure having 7.9 hydrogen wt%. According to the simulations, the H_2 molecules can be adsorbed on Ca by Kubas mechanism with elongation in H−H bond distance. The calculated hydrogen interaction energy is found in the range between 0.25 and 0.30 eV while desorption energy varies between 0.15 and 0.32 eV. The charge transfer during hydrogen adsorption is investigated by Hirshfeld charge analysis and electrostatic potential map. The molecular dynamics simulations revealed a high degree of reversibility in hydrogen adsorption of the system at ambient conditions. The useable capacity of H_2 is explored by calculating occupation number at adsorption and desorption conditions. The energetics and storage capacity meets the US DOE target which makes the MOF-Ca_8 as a potential hydrogen storage material.
12.	Intelligent design optimization of battery pack enclosure for electric vehicle by considering cold-spraying as an additive manufacturing technology "COLD-SPRAY AS AN ADDITIVE MANUFACTURING TECHNOLOGY" SK Pal, S Singh, H Singh, ML Le Phung, S Yooyen… - Energy Storage, 2020 Abstract: Vibrations shocks induced during working conditions cause stresses and deformations of the battery case parts and heating may cause fire, which affects vehicle safety. Hence, the battery case and its parts should be of better mechanical features and lightweight to make the vehicle more efficient and safer. To achieve all the requirements, cold spraying found to be the potential technology for additive manufacturing the parts with better conductivities and lesser porosities as compared to the parts produced by conventional methods. Therefore, this paper has proposed a consideration of the cold spray technology to improve the mechanical performances of the battery casing, including maximizing the minimum natural frequency and minimizing the maximum deformation. ANSYS Workbench has been used for finite element modeling of battery pack enclosures. The model of the battery pack enclosures has been analyzed by obtaining the natural frequencies of the order ten. Further, static analysis has been performed to get the maximum deformation. Finally, a parametric model has been established and multi-objective optimization has been performed. The results obtained with the cold sprayed process show that the value of maximum deformation is being lowered by 59.49% and has a much higher value of natural frequency than that obtained with conventional methods.
13.	Metal-free domino Cloke-Wilson rearrangement-hydration-dimerization of cyclopropane carbaldehydes: A facile access to Oxybis (2-aryltetrahydrofuran) derivatives R Dey, S Rajput, P Banerjee - Tetrahedron, 2020 **Abstract:** In this work, we have demonstrated a metal-free transformation of cyclopropane carbaldehydes to oxybis(2-aryltetrahydrofuran) derivatives via a domino Cloke-Wilson rearrangement-hydration-dimerization sequence. Commercially inexpensive *p*-toluene sulfonic acid (PTSA) was used as a Brønsted acid catalyst, and reactions were conducted in an open-flask. Detection of reaction intermediates were carried to get an insight into the reaction pathway.
14.	Microfriction stir welding of AA 6061-T6 thin sheets using in-house developed fixture R Nadda, M Babal, N Jalan, CK Nirala - Journal of Micromanufacturing, 2020 **Abstract:** The present work examines microhardness, tensile strength, and microstructure in microfriction stir welding (μ-FSW) of 0.5 mm thick AA 6061-T6 sheets. The capability of in-

	house developed work fixture and welding tools to attain nondamaged and continuous welds has been verified through multiple runs at different tool traverse speeds. On examination, it was found that by using the proposed work fixture, weld strength reached up to 57% as that of the base metal when performed at tool traversing speed of 150 mm min^{-1}. The dynamic recrystallization during μ-FSW may lead to the formation of equiaxed grains in stir region and transition zone. The microstructure showed that the thermomechanically affected zone reduced with tool traversing speed.
15.	Modelling and performance analysis of FFR-aided two layer aerial-terrestrial network D Saluja, S Kumar - IET Communications, 2020 **Abstract:** Exploiting aerial base stations (A-BSs) in conjunction with terrestrial base stations (T-BSs) is an effective solution to provide uniform coverage everywhere, and anytime. However, the addition of A-BSs in an existing terrestrial network would intensify the inter-cell interference to user equipment, leads to a degraded signal-to-interference-ratio. There is a need to exploit inter-cell-interference-coordination (ICIC) scheme in such aerial-terrestrial network. Further, the aerial-terrestrial network requires a multi-layer environment to be modelled in many scenarios. In this study, the authors propose fractional frequency reuse (FFR) scheme as an ICIC scheme for two-layer aerial-terrestrial network. The analytical expression of coverage probability and average rate are derived for the proposed scheme, and compare it with the scheme, where no ICIC is considered in aerial-terrestrial network, and conventional scheme, where only T-BSs are considered. It is shown that the proposed scheme outperforms the no ICIC scheme and conventional scheme. Simulation results are shown to support their analytical results.
16.	Nitrosoarene-Catalyzed Regioselective Aromatic C–H Sulfinylation with Thiols under Aerobic Conditions I Chatterjee, S Pradhan, S Patel - Chemical Communications, 2020 **Abstract:** Aromatic amines, (hetero)arenes, such as indoles and pyrroles, are regioselectively sulfinylated under mild aerobic condition using nitrosoarene as a redox-catalyst. Nitrosoarene is involved in the electron transfer process with arene to generate a crucial arene radical cation intermediate for C–H sulfinylation. The present methodology requires no directing group, can be scaled up easily and is applicable for the late-stage functionalization of drug molecules and natural products with high regioselectivity.
17.	Novel Analytical Approach for Estimation of Thermal Diffusivity and Effusivity for Detection of Osteoporosis A Sharma, R Mulaveesala, V Arora - IEEE Sensors Journal, 2020 **Abstract:** Infrared thermography is a full field, non-contact inexpensive, patient friendly and safe imaging modality for estimation of thermo-physical properties of various biomaterials. Among the widely used thermal wave imaging modalities, recently proposed frequency modulated thermal wave imaging technique gained importance due to its quantitative characterization capabilities along with its deeper subsurface visualization abilities. This work highlights a novel analytical analysis for three dimensional Fourier heat diffusion equation by considering internal heat generation. An aperiodic pulse compression favorable thermal wave imaging method is proposed for estimation of thermo-physical properties of bone for identification of severity of osteoporosis. Effect of osteoporosis on thermo-physical properties such as thermal effusivity and diffusivity has been studied. Further proposed analytical approach has been validated by results obtained from the commercially available finite element based COMSOL software.
18.	On the Role of Interacting Particles and Limited Resources in the Regulation of Lattice Length Dynamics AK Verma, N Sharma, AK Gupta - Journal of Statistical Physics, 2020

	Abstract: Motivated by the significant effect of particle–particle interactions on the driven stochastic transport system, we examine how interacting particles control the lattice polymerization and depolymerization dynamics under the restricted supply of involved resources. We carried out a theoretical analysis based on the simple mean-field and cluster mean-field theory to predict the fundamental role of interactions on the steady-state length dynamics. It has been detected that there is a strong correlation between the lattice length dynamics and the concentration of the total number of lattice sites in the reservoir. For lower and higher values of available resources, depolymerization and polymerization process dominates the lattice dynamics, respectively, while for intermediate values of resources we observe a competition between polymerization and depolymerization kinetics. Further, it is examined that for a specific range of interaction energy E, the system remains in low density phase, on the contrary, for its significantly higher value, the system transits to high-density phase. In contrast to the high density phase, it is observed that in low density phase, lattice length decreases with an increase in interaction strength. Finally, the theoretical outcomes are validated with extensive Monte Carlo simulations.
19.	Origin of enhanced carrier mobility and electrical conductivity in seed-layer assisted sputtered grown Al doped ZnO thin films N Kumar, AH Chowdhury, B Bahrami, MR Khan…M Kumar - Thin Solid Films, 2020 **Abstract:** In the present study, a ZnO seed-layer assisted sputtered deposition approach is used to enhance the carrier mobility and electrical conductivity of Al doped ZnO (AZO) thin film. The seed layer assisted grown AZO thin film showed an electrical conductivity, optical transmittance, and high figure-of-merit of 1806.94 ± 10.50 S/cm, >90% (Vis-NIR), and $1.68 \times 10^{-2}\ \Omega^{-1}$, respectively. This high optoelctronic properties make AZO thin film qualified to be used for transparent electrode applications. The carrier mobility in the seed-layer assisted grown AZO thin film is observed to be 15.21 ± 0.04 cm^2/Vs which is two-fold higher than AZO thin film grown without seed-layer. The origin of enhanced carrier mobility is investigated in the light of generated defects and their nanoscale distribution in the polycrystalline AZO thin film during the sputtering process. The low grain boundary potential is observed in seed layer assisted grown AZO thin film using nanoscale Kelvin probe force microscopy and was attributed to the low defects segregation towards grain boundaries. The argument of low carrier defects like zinc interstitial and oxygen vacancies in seed-layer assisted grown AZO thin film is experimentally verified using X-ray photoelectron spectroscopy analysis. The analysis of defect chemistry and their nanoscale distribution helps us to understand that intrinsic defects and their segregation at grain boundaries critically affect the carrier mobility in AZO thin film.
20.	Structural rejuvenation of thermal spray coating through stationary friction processing HS Arora, M Rani, G Perumal, M Roy, H Singh, HS Grewal - Surface and Coatings Technology, 2020 **Abstract:** In this study, a novel processing technique for microstructural refinement of Ni-Cr-5Al_2O_3 composite coating developed using high velocity oxy-fuel (HVOF) technique is demonstrated. The processing technique, known as stationary friction processing (SFP) is an adaptation of the well-known friction stir processing (FSP). The as-sprayed coating showed a typical lamellar microstructure along with non-homogeneous elemental distribution. The SFP treatment resulted in significant microstructural refinement with complete elimination of splat boundaries and pores together with fully homogeneous elemental distribution. The performance of as-sprayed and processed coatings was evaluated in slurry erosion, erosion-corrosion and pure corrosion in 3.5% NaCl solution. At oblique impingement angle, the SFP treated sample showed minimum erosion rate of nearly 0.1 mm^3/h which is 3–5 times lower than the as-sprayed coating and the substrate. For normal impingement, the erosion rate of SFP specimen was nearly 30% lower compared to the as-sprayed coating and the substrate. This is attributed to higher hardness

	as well as fracture toughness of the SFP treated coating as a result of microstructural refinement. In addition, the SFP treated coating was able to demonstrate superior resistance under erosion-corrosion conditions as well. Further, the processed sample showed lowest corrosion rate of 0.079 μA/cm^2, 5–6 times lower than the as-sprayed coating (0.39 μA/cm^2). The enhancement in the corrosion resistance of the coating after processing is attributed to complete homogenization of the coating with removal of all splats, splat boundaries, pores and regions of elemental segregation.
21.	Studies on Mixed Convection and Its Transition to Turbulence—A Review S Gorai, SK Das - 50 Years of CFD in Engineering Sciences, 2020 **Abstract:** Studies on mixed convective fluid flow and heat transfer are much more scarce compared to the large volume of literature available on either forced or natural convection. This is primarily because it was thought that applications of comparable forced and natural convection simultaneously are rather limited. However, the recent advent of high heat flux computing and LASER equipment and the need for their cooling has made mixed convection more relevant. The present review traces the development of studies in mixed convection over the last half a century. The most tricky and complex question in this respect may be that of the onset of turbulent flow in mixed convection. A clear and acceptable criterion for the transition of laminar flow to turbulent in this regime is still evasive. Hence, the review has culminated into a relook into the studies dedicated to these transition characteristics.
22.	Temperature Aware Adaptations for Improved Read Reliability in STT-MRAM Memory Subsystem S Sethuraman, VK Tavva, K Rajamani… - IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2020 **Abstract:** Spin transfer torque magneto-resistive random-access memory (STT-MRAM) is an exciting new emerging technology, being considered as a strong candidate to fill the gaps in the existing memory hierarchy between DRAM and the secondary memory. STT-MRAM has adequate endurance. However, unresolved write switching and read reliability issues still exist at the functional operating temperature corners. One biggest challenge is that the Read Bit Error Rate (RBER) is not at an acceptable level for system reliability across wide operating temperature range. We present a STT-MRAM memory subsystem that is fully compatible with existing DDR based DIMM designs and evaluate read disturb and read sense BER under various operating temperature conditions. We propose temperature aware adaptive techniques for reliable reads at rank level. The proposed temperature adaptation technique improves overall reliability of the DDR4 STT-MRAM based memory subsystem with an optimal read current considering an acceptable 64 byte cacheline BER. Our full system simulations show 1000X order of improvements toward a cell raw read disturb BER along with 5% reduction in memory power and less than 1% impact on overall system performance.
23.	The structure of water–DMF binary mixtures probed by linear and nonlinear vibrational spectroscopy D Tomar, B Rana, KC Jena - The Journal of Chemical Physics, 2020 **Abstract:** Attenuated total reflectance Fourier transform infrared spectroscopy and sum frequency generation (SFG) vibrational spectroscopy have been employed to probe the molecular structure of *N*,*N*-dimethylformamide (DMF) and water mixture by varying the concentration of DMF. From the bulk studies, we observed a gradual decrease in the intensity with a continuous blue shift in the OH-stretch region with the increase in the DMF concentration. In contrast, no significant blue shift in the OH-stretch region is noticed from the SFG spectra collected from the air–aqueous binary mixture interface as a function of DMF concentration. However, the impact of DMF is found to be disruptive in nature toward the existing hydrogen bonding network of the pristine water at the interfacial region. Interestingly, in

	the CH-stretch region, the vibrational signatures of the DMF molecule show blue shifts, as proposed in earlier studies. We have calculated the molecular tilt angle of the methyl group of the DMF molecule as a function of DMF concentration. For the case of neat DMF, the observed tilt angle is ~17.7° with respect to the surface normal. The value of tilt angle decreases with the decrease in DMF concentration and reaches a value of ~1.7° for a mole fraction of 0.5, and it further increases with the decrease in DMF concentration. It achieves a value of ~20° for the dilute DMF mole fraction of 0.05 in the binary mixture. This indicates that DMF molecules at the air–binary mixture interface are placing their methyl groups more toward the normal for the intermediate DMF concentrations.
24.	Towards Dynamics and Control of Modular Reconfigurable Manipulators A Dogra, SS Padhee, E Singla - Proceedings of the Advances in Robotics, 2019 **Abstract:** This paper focuses at the dynamic modeling of a modular reconfigurable manipulators. Dynamic model of the manipulator changes with each reconfigured posture and therefore, control implication on this type of robotic arm changes. Adaptability of the dynamic model and controller to incorporate this change is a challenge. Idea of re-configurable robot is presented here to address the issue of customized robotic arms. These modular robots can be deployed quickly on site. In this work, architectural parameters of the reconfigurable modules, which affect significantly in the dynamics of the manipulator, are identified and the inertial parameters of the modules are approximated using the concept of equimomental system. Considerations of parameters in dynamic modeling after assembly of the heterogeneous modules are introduced. Euler-Lagrange formulation is used while formulating the equation of motion. Finally, a control simulation is shown for a 4 degrees-of-freedom (dof) modular configuration.
25.	Understanding the Co: Mo Compositional Modulation and Fe-Interplay in Multicomponent Sulfide Electrocatalysts for Oxygen and Hydrogen Evolution Reactions R Srivastava, A Mukherji, R Bal – ChemElectroChem, 2020 **Abstract:** Amidst the escalating urge in the economical generation of clean hydrogen fuel from water, this article presents the development of simple and economical electrocatalysts, Cobalt Molybdenum Sulfides (Co-Mo-S), for oxygen evolution (OER) and hydrogen evolution (HER) reactions. The compositional modulation of Co and Mo produces the highly active catalysts, Co0.75Mo0.25Sx for OER and Co0.40Mo0.60Sx for HER. Moreover, the potentiality of Fe incorporation in CoMoSx is demonstrated in enhancing the OER performance of the catalyst. The best catalyst for OER (Fe0.05Co0.70Mo0.25Sx) achieves a current of 10 mA cm-2 at an overpotential (η10) of 227 mV (1.457 V vs RHE) while that for HER (Co0.40Mo0.60Sx) requires only 130 mV (-0.13 V vs. RHE) of η10. The holistic enhancement of the OER kinetics is attributed to the facile generation of CoOOH in the co-existence of Fe at oxidation states ≥ +3, and Mo at +6 and +5 states. Finally, a complete water electrolyser is demonstrated using Fe0.05Co0.70Mo0.25Sx as the anode and Co0.40Mo0.60Sx as the cathode.

Disclaimer: This publication digest may not contain all the papers published. Library has compiled the publication data as per the alerts received from Scopus and Google Scholar for the affiliation "Indian Institute of Technology Ropar" for the month of March 2020. The author(s) are requested to share their missing paper(s) details if any, for the inclusion in the next publication digest.