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GC-RASM 2021

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[< Previous vol/issue](#)

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Research article Abstract only

Significance of dynamic control on suddenly expanded flow when nozzles are over, under, and perfectly expanded

Abstract

Abstract

In this paper, investigations are carried out to quantify the usefulness of the flow control in the recirculation and the growth of the flow in the tube at supersonic Mach numbers for pipe diameter 18mm. Only those cases are shown when there is an effect of the flow control management on the stream pattern. Mach numbers of study are 1.87, 2.2, and 2.58 at various expansion levels for duct sizes 2D, 4D, 6D, and 10D. For the highest duct lengths, 6D and 10D flow fields of the duct turn oscillatory and control reversal phenomena are observed. For short ducts 1D and 2D, no such phenomena are seen. When nozzles face under-expanded or over-expanded flow at Mach 1.87 and 2.2, the flow control management does not give the needed outcomes and results in decreased pressure. Also, it is seen that at Mach 2.58, nozzles remain over-expanded, and when control is used, they end up in a rise of pressure of the tube. The minimum duct

Research article Abstract only

Experimental evaluation of sorptivity for high strength concrete reinforced with zirconia rich glass fiber and basalt fiber

Ajmal Paktiawal, Mehtab Alam

Pages 1132-1140

Article preview 

Abstract

Abstract

In the abstract mentioned concrete in structures is subjected to various environmental loads such as chloride attack, sulphate attack, and gases during its life are the main idea of the authors. Concrete being weak in tension loses its tensile strength on account of these loads and distress in concrete appears in the form of cracks leading to corrosion of reinforcing steel. The service life span thus of an RCC structure is impaired. To enhance the concrete strength particularly in tension, in this research work, zirconia rich glass fiber, and basalt fiber with 1:1 combination of 12mm and 18mm standard cut length with 0.8, 1.2, 1.6, 2.0, and 2.4% by cement weight are used in high strength concrete. Experimental studies are performed on fresh concrete for workability and hardened concrete specimens for demoulded density, compressive strength, pulse velocity, percent voids, and sorptivity after 28 days of normal curing. It is found that 1.2% glass and

S. Jagan, T.R. Neelakantan, M. Padma Lakshmi

Pages 1141-1147

Article preview 

Abstract

Abstract

Owing to increased population and industrial expansion, the necessity for aggregates in construction is growing rapidly. Conversely, the production of aggregates results in the degradation of natural resources, posing a threat to the construction industry's long-term viability. To counteract the above concerns, the use of recycled coarse aggregates (RCA) as a suitable replacement to natural coarse aggregate (NCA) was developed. However, the adherence of mortar on the RCA exhibit higher porosity and that affects the quality of the RCA. So, in this study, the quality of RCA was enhanced through the bio deposition approach by *Bacillus Subtilis* and *Bacillus Sphaericus*. The microbes precipitates the CaCO_3 that deposit and fills the pores on the surface of RCA. The mechanism resulted in the reduction in the water absorption and increase in the mechanical properties of the RCA. Microstructure investigations affirm the precipitation of CaCO_3 by

Research article Abstract only

Development and strength assessment of sustainable high strength fiber reinforced concrete

G. Jayakumar, Mervin Ealiyas Mathews, Tattukolla Kiran, B. Siva Kumar Yadav, ... N. Anand

Pages 1148-1153

Article preview 

Abstract

Abstract

Recent developments in the infrastructure urged the requirement of developing concrete with high performance. This research work presents the development of sustainable High Strength Fiber Reinforced Concrete (HSFRC), and its mechanical properties such as compressive strength, tensile strength and flexural strength compared to conventional High Strength Concrete (HSC). Ordinary Portland Cement (OPC) was replaced with optimum amount of Micro-Silica (MS) and Pumice Powder (PP) by 15% and 10%. Hybrid Fibers (HF) are added in the mix of 1.5% by volume of concrete. The fibers used are Steel Fiber (SF), Poly-Propylene Fiber (PPF), Basalt Fiber (BF) and Carbon Fiber (CF). Effect of fiber and its performance are compared with

Impact of Mach number on the flow pattern in suddenly expanded duct

Sher Afghan Khan, Zakir Ilahi Chaudhary, Maughal Ahmed Ali Baig, Ridwan, ... Mohammed Faheem

Pages 1154-1161

Article preview 

Abstract

Abstract

A study is undertaken to assess the dynamic control's effectiveness at two supersonic Mach numbers, 2.2 and 2.58 being considerably large Mach number being very significant in the design of High-speed aerospace vehicles. The relief available to the flow while the shear layer exits from the nozzle and enters the enlarged duct. The investigation area ratio is 4.84, and the NPR tested is from 3 to 11, covering the various level of expansion. The investigation was done for eight sizes of circular duct cases. Still, the results are discussed only when a significant change in the wall pressure is noticed during the experimentation. The dynamic control is located at a 6.5 mm radial distance from the primary jet's axis, with a 1 mm diameter generating at sonic Mach from the active flow control management. For lower duct length at NPRs, the wall pressure assumes large values. Later with a rise in the duct section and NPR a progressive decline in the

Research article ○ Abstract only

Effect of welding conditions and flux compositions on the metallurgy of welded duplex stainless steel

I.M.B. Omiogbemi, S. Pandey, D.S. Yawas, M.O. Afolayan, E.T. Dauda

Pages 1162-1168

Article preview 

Abstract

Abstract

This research tends to investigate the influence of shielded metal arc welding (SMAW) parameters and flux compositions on the metallurgy of welded AISI 2205 duplex stainless steel (DSS). The consumable was developed using the $\text{Al}_2\text{O}_3\text{-TiO}_2\text{-SiO}_2$ flux system as major flux ingredients. The spectrophotometer was used for determining the chemical composition of the base core wire and the base plate. The six different

Research article Abstract only

The effect of cutting fluid in improving the machinability of Inconel 718 using ceramic AS20 tool

Ivan Sunit Rout, P. Pal Pandian, Anil Raj, Anil Melwyn Rego

Pages 1169-1174

Article preview 

Abstract

Abstract

Industries demand a vast usage of superalloys in heat resistant and high temperature applications. These include nozzle of rocket fuel engines, throttle valve of turbojet engines, turbine blade discs of aerospace industries, rivets and fittings of chemical and production industries, biomedical applications in super strength resistive steels. These superalloys such as Inconel 718 finds its vast applications in all such industries. To machine such materials a lot of wear and tear occurs at the cutting tool. Hence, cutting fluid helps in reduction of tool wear and improving surface roughness. In this paper, two cutting fluids Koolkut 40 and Hicut 590 have been used in emulsified form during the machining of Inconel 718 with Ceramic cutting tool. Hicut 590 has been seen a better heat resistive cutting fluid in reducing the tool wear and thus improving the life of the tool

Research article Abstract only

Enhanced concrete performance in cracking resistance and chloride penetration using hybrid fiber blends

Manjunath V. Bhogone, Kolluru V.L. Subramaniam

Pages 1175-1179

Article preview 

Abstract

Abstract

6/22/24) relationships are obtained for the concrete with FRP and hybrid FRP/CFRP. The measured fracture test responses. The hybrid fiber blend has a higher tensile strength and a significantly higher stress resistance to crack opening when compared to an identical volume fraction of steel fibers. HyFRC also exhibit a lower chloride penetration when compared to control and SF concrete mixtures. The hybrid blend

Research article Abstract only

Design of multipurpose mechanical Machine

Ajay Bonde, N.K. Mandavgade, S.R. Jachak

Pages 1180-1184

Article preview 

Abstract

Abstract

This paper focuses on designing of Multi-Purpose Mechanical Machine. The research specializes in design and development of multi-purpose machine tool which is able to perform multiple operations like drilling, cutting and grinding simultaneously and can also performs one operation at a time as per the requirement. The functions of machine tools are to transform the raw substances with the help of machining operation to finished part with precise geometry, dimensions and surface quality. The call for is increasing to provide elements with high standard at minimal cost, the machine tools are required to have better machining, precision and speed. This research paper proposed a machine which can perform operations like drilling, cutting and grinding simultaneously which means that industrialist have no need to purchase different machines for different operational task

Research article Abstract only

One-pot hydrothermal synthesis of polypyrrole/Fe₂O₃ nano-seeds for energy storage application

Nandana Babu, A.R. Athira, T.S. Xavier

Pages 1185-1188

Article preview 

Abstract

Abstract

6/22/24, 2:43 PM Materials Today: Proceedings | GC-RASM 2021 | ScienceDirect.com by Elsevier

morphology of polypyrrole/Fe₂O₃ achieved by lowering both the reaction temperature and time (150 °C for 4h), which are appreciable for energy storage applications. The obtained PPy/Fe₂O₃, analyzed using different techniques like X-ray photoelectron spectroscopy (XPS), Field Emission Scanning Electron Microscopy (FESEM), Fourier Transform Infrared (FTIR) spectroscopy. Compositional and morphological studies confirmed the formation of interconnected PPy/Fe₂O₃ nano-seeds. Cyclic Voltammetry response displays superior electrochemical performance of the PPy/Fe₂O₃. The interconnected nanostructures with

Research article Abstract only

Steady-state and transient Raman gain coefficients of weakly-polar magnetoactive doped semiconductors

Jaivir Singh, Sunita Dahiya, Manjeet Singh

Pages 1189-1195

Article preview 

Abstract

Abstract

Assuming that the origin of stimulated Raman scattering (SRS) lies in third-order effective (Raman) susceptibility arising due to nonlinear induced polarization, we obtained expressions for steady-state and transient Raman gain coefficients of weakly-polar magnetoactive doped semiconductors under various geometrical configurations. The threshold pump intensity and optimum pulse duration for the onset of transient SRS are estimated. The dependence of Raman gain coefficients on doping concentration, external magnetostatic field, magnetostatic field inclination, scattering angle and pump pulse duration are explored in detail with aim to determine suitable values of these controllable parameters to enhance Raman gain coefficients at lower threshold intensities, and to search the feasibility of efficient semiconductor nonlinear devices based on Raman nonlinearities. Most expectedly, the technological potentiality of weakly-polar

Research article Abstract only

Pressure dependent chemical changes of adsorbed water in MIL-47 (V) by raman spectroscopy

K. Kamali, Chandrabhas Narayana

Pages 1196-1199

Abstract

Pressure-dependent structural and chemical changes of the metal–organic framework (MOF) compound MIL-47(V) have been investigated up to 2.9 GPa using pore-penetrating liquid, water as pressure transmitting medium (PTM). Under compression, MIL-47(V) undergoes reversible replacement of the free terephthalic acid (TPA) by H₂O molecules near 0.7 and 1.5 GPa. The observed structural and chemical changes observed in hydroxyl linked vanadium octahedra in as-synthesised MIL-47(V) demonstrate unique high pressure chemistry depending on the type of bridging octahedral group in framework structure. The tunable bridging group in MIL-47(V) allows postsynthetic room temperature by pressure-induced removal and insertion of organic molecules in MOFs through the formation of stable phases at ambient conditions.

Research article Abstract only

An investigation on the performance and viability of a hybrid twisted blade profile for a horizontal axis micro wind turbine

Ratan U. Gaonkar, Ramakrishna N. Hegde

Pages 1200-1209

Article preview 

Abstract

Abstract

With the ever-growing concern about green and clean energy, one of the most viable options is wind power. Though the concept of a micro wind turbine is not new, exploring the best blade profile that would improve the performance is quite challenging. An ideal blade profile for a roof-mounted micro wind turbine could be the one that would offer the lift at the lowest available wind velocity. This paper presents such a proposal wherein a hybrid twisted blade profile modelled out of NACA4412 and E193 airfoils are used for the investigation. Three different profiles viz. a simple tapered blade (NACA 4412), a twisted tapered blade (NACA4412) and a hybrid twisted tapered blade (Hybrid of NACA4412 and E193) are considered and tested using CFD tool followed by experimental validation using a simple tapered blade in a wind tunnel. The test parameters included different air velocities (2 m/s to 8 m/s) at different angles of attack (−10° to +10°). The

Research article Abstract only

[Article preview](#) 

Abstract

Abstract

Surface microtexturing accomplishes a substantial role in enhancing the interfacial functional performance of machine-driven components. For producing good-quality square micropatterns, maskless electrochemical micromachining (EMM) is a viable option. Maskless EMM is employed for producing micropatterns, wherein the workpiece remains close by interaction with the mask tightly enclosed to the coated tool surface, and the electrolysis of job involves in the enclosed cell. The special micropatterning setup is developed to produce the good quality square micropatterns including micropatterning cell, pulsed electrical unit and perpendicular cross flow electrolyte system. The developed flow method on the job surface in this unit produces better good quality micropatterns. A reused textured tool and developed flow method is applied in maskless EMM in an enclosed unit which eradicates the sludges and fabricate

[Research article](#) [Abstract only](#)

Migration induced localization of multiwalled carbon nanotubes in PP phase of PP/ABS blend and their hybrid composites: Influence on mechanical and thermal properties

Ganesh Lohar, Pankaj Tambe, Bhagwan Jogi

Pages 1215-1224

[Article preview](#) 


Abstract

Abstract

Carbon black (CB) and multiwalled carbon nanotubes (MWNTs) reinforced 80/20 (wt/wt) polypropylene (PP)/acrylonitrile butadiene styrene (ABS) blends and its composites in presence of dual compatibilizer are processed using twin screw extruder followed by injection moulding. The two-step processing is adopted to disperse the MWNTs and CB in 80/20 (wt/wt) PP/ ABS blends in presence of dual compatibilizer. Initially, MWNTs are dispersed with ABS using melt-mixing followed by addition in PP matrix in presence of CB and dual compatibilizer using melt-mixing. A solution experiments is performed to selectively etch the PP and ABS phase respectively show the migration of MWNTs in the PP phase; and CB is localized in the PP phase. Scanning electron microscope (SEM) observation reveal the formation of matrix-droplet morphology for

A Sinthiya

Pages 1225-1229

Article preview 

Abstract

Abstract

This study investigated the bio-electro-chemical cell behaviour of ethanolic leaf extract of *Prosopis juliflora* as an electrolyte in vegetative voltaic cell. The phytochemical constituent analysis performed using High Performance Liquid Chromatography HPLC in association with standard screening test. In this model Tin, Silver, Platinum and Copper coated electrode utilized for measuring voltage as a function of ionic current density. Due to the chemical constituents present in ethanol extract of *Prosopis juliflora* leaves diluted electrolyte, there is a movement of ions between the anode and cathode. By changing the gap between anode and cathode the developed potential measured and compared for different electrodes.

Research article Abstract only

Valorization of soda lime glass in cement sand matrix

Jagriti Gupta, A.S. Jethoo, P.V. Ramana

Pages 1230-1238

Article preview 

Abstract

Abstract

Nowadays concrete and mortar demand as construction materials has been surged in market due to the exorbitant augmentation of the construction industry. Cement and fine aggregates (like river sand, pit sand etc.) are consumed in a large quantity to produce the mortar for various uses. In this venture, the cement and natural sand is been replaced with the soda-lime glass and the properties of mortar has been characterized for this replacement. Various proportions adopted for the cement replacement by weight 0–20% and natural sand replacement by weight are used 0–30% at 5% interval. The influence on the workability, density, water absorption, mechanical strength, drying shrinkage and Alkali Silica Reaction

Studies on computing compressive strength of zeolite blended concrete using multiple regression analysis

Sushant Waghmare, Amey Katdare, Nandkumar Patil

Pages 1239-1245

Article preview 

Abstract

Abstract

Concrete is most extensively adopted materials for construction, due to its high ration of durability to cost. The important factor on which concrete performance depends is characteristics of cement consumed during concrete production. Greater the environmental and economic profits can be achieved when addition of Pozzolanic mineral additives such as fly ash, GGBFS in Concrete production. It is normally accepted that adding of pozzolan decreases the amount of calcium hydroxide in paste of cement and raises the perviousness of concrete.

Zeolites are alumina silicates having crystalline properties with even pores and hollows. They hold exceptional characteristics, such as molecular sieves, ion exchange, a huge area of Surface, and catalytic

Research article ○ Abstract only

Structural response of self-compacting concrete beams under elevated temperature

Mervin Ealiyas Mathews, A. Diana Andrushia, Tattukolla Kiran, B. Siva Kumar Yadav, ... N. Anand

Pages 1246-1254

Article preview 

Abstract

Abstract

Aim of the research work is to examine the behaviour of Self-Compacting Concrete subjected (SCC) to elevated temperature. This research work examines the effect of water cooling on flexural behaviour of M25 and M40 grade SCC. The results of the investigation will enable the designers to choose the appropriate material for fire safety considerations. To understand the effect of elevated temperatures on different grades of reinforced Self-Compacting Concrete (SCC) beams an extensive experimental

Research article Abstract only

Multiobjective optimization of thermophysical properties of Indonesian fly-ash nanofluid

Khuram Maqsood

Pages 1255-1262

Article preview 

Abstract

Abstract

Nanofluids with thermal and viscous tunable properties are seen to be smart fluids of the future generation. In determining the viscous and heat transfer characteristics, the concentration of nanomaterials is important. Generally, an optimal concentration of nanomaterial is needed to design a sustainable and cost-effective heat transfer process. This study includes modeling and optimization of various thermal and viscous temperature-dependent characteristics for differing nanofluid concentrations. The nanofluids containing fly-ash nanoparticles dispersed in water are used in this work. The Response Surface Methodology (RSM) is used to model and optimize the thermophysical properties of nanofluids. The higher volume of nanoparticles in the solution not only increases the heat transfer but also increases the fluid's viscosity leading to higher energy requirements for transportation. The study's key objective is to find the

Research article Abstract only

RF-sputtered V₂O₅ thin films on two different glass substrates

S. Tipawan Khlayboonme, Warawoot Thowladda

Pages 1263-1267

Article preview 

Abstract

Abstract

Thin V₂O₅ films were deposited on two different commercial soda-lime glass substrates (A and B) by O₂ reactive radio frequency magnetron sputtering using a vanadium target. The influences of the surface energy and roughness of the substrates on the structure and atomic bonding of the films were examined. The film on

Research article Abstract only

Prediction of mechanical properties for polyetheretherketone composite reinforced with graphene and titanium powder using artificial neural network

Mohamed Zakoulla, Younus pasha, Shylesh kesarmadu Siddalingappa

Pages 1268-1274

Article preview 

Abstract

Abstract

High performance Polyetheretherketone (PEEK) hybrid composite were synthesized by reinforcing different wt% of Graphene (C) and Titanium powder (Ti) using Injection molding for applications such as compressor plate valves, piston parts, impeller wheels for regenerative pumps, shock absorber bearings, gears for oil and gas companies, cams, ball bearing cages aircraft exterior parts. For modeling and prediction of mechanical properties of PEEK/C/Ti composite, a multi layer perceptron feed forward neural network was constructed using input vectors as wt% of PEEK and reinforcements. Hardness, Tensile strength, Tensile elongation, and Modulus of elasticity are output vectors for polymer composite. The proposed ANN model for PEEK composites delivers satisfactory results in comparison to experimental measurements. The correlation factor connected with training and test dataset was greater than 0.9. 3-D plots for the predicted

Research article Abstract only

Profound probing of Groundnut Shell Ash (GSA) as pozzolanic material in making innovative sustainable construction material

P.V. Premalatha, S. Senthil Kumar, C.S. Murali, K. Vetri Aadithiya

Pages 1275-1280

Article preview 

Abstract

Abstract

6/22/2024 11:41 AM
strength, water absorption and efflorescence. The results showed that the use of GSA in fly ash bricks. GSA when used in the making of unburnt bricks gives a satisfactory result in terms of its compressive strength. The strength obtained under optimum combination was found to be nearly equal to the prescribed value for first-class bricks. Water absorption was found to be 12.17% and efflorescence was found to be 8% which is well within the prescribed limit as per Bureau of Indian Standard. From the test

Research article Abstract only

Effect of particle damper technique on tribological properties during hard turning process

G. Lawrance, P. Sam Paul, D. Joshwa, S. Sharvilin, ... R. Arun

Pages 1281-1285

Article preview 

Abstract

Abstract

In turning process, tribological properties is a significant factor that affects production in the manufacturing sector. In the present study, particle damper is used to enhance the tribological properties during turning process. A particle damper is offered by means of particle which dissipate energy through friction and inelastic collisions. A particle damper with variable material, size, and filling in a turning tool is fabricated in this work. A 27 run experiments were conducted to find the effect of particle damping on tribological properties during the turning process. The particle in the turning tool will collide with one another and increases the rigidity of the tool holder which enhances the tribological properties. The experimental results, S/N ratio and ANOVA analysis shows that when stainless steel particle is partially filled with smaller size achieve enhance tribological properties. The results were compared without particle damper and found

Research article Abstract only

Effect of filler wire strength on high strength low alloy steels

Merbin John, P. Ashok Kumar, K. Udaya Bhat

Pages 1286-1293

Article preview 

Abstract

weld thermal cycles. Apart from heat input and width of HAZ, selection of filler wire also plays an important role, to achieve the minimum strength requirement of the parent material. Steel plates with 800MPa ultimate tensile strength were butt welded using pulsed gas metal arc welding (P-GMAW) process, with undermatching, matching and overmatching strength filler wires. Welding parameters were selected in such a way that the heat input per unit weld length is almost constant. In all the samples, microstructural features were similar in the HAZ region. Static tensile tests indicated that failure in the samples welded using undermatching filler occurred at welded region, whereas the samples welded with matching and overmatching fillers failed at HAZ region. Further fracture studies indicated that in case of under matching

Research article Abstract only

Synthesis and characterization of acid treated reduced graphene oxide

Pankaj Tambe

Pages 1294-1297

Article preview 

Abstract

Abstract

Graphene oxide is successfully synthesized using Hummer's method and Hummer's method with additional KMnO_4 . Hummer's method with additional KMnO_4 shows higher oxidation of graphite as compared to Hummer's method. The reduction of graphene oxide using sodium hydrosulfite shows some of functional group remains on the lattice of graphite as clear from FTIR spectra. Further, acid treatment of graphene is carried using H_2SO_4 at 90°C for 90 min, showing removal of functional group of graphene from the surface revealed by XRD and obtaining more pure graphene.

Research article Abstract only

Numerical study of fluid flow and heat transfer for flow of Cu- Al_2O_3 -water hybrid nanofluid in a microchannel heat sink

V. Murali Krishna, M. Sandeep Kumar, R. Muthalagu, P. Senthil Kumar, R. Mounika

Pages 1298-1302

Abstract

The use of micro-electronic devices in many applications such as aerospace, telecommunications, micro-electronics, robotics is drastically increasing and they need efficient cooling system. Micro-channel heat sinks (MCHS) are getting significant importance due to their very high surface to volume ratio and high heat dissipation rate. The hybrid nanofluids playing a vital role as cooling fluids in various thermal transportation applications due to their extraordinary heat transport characteristics. A numerical study is taken up for laminar flow of hybrid nanofluid as a heat transport medium in a rectangular MCHS to realize thermal and hydrodynamic behaviour in forced convection. The influence of Reynolds number (Re) and volume concentration of nanoparticles in Cu-Al₂O₃/water hybrid nanofluid on MCHS performance is investigated in the present paper. The correlations presented in the literature are used to calculate the

Research article Abstract only

Experimental investigations of wire lag phenomena on wire electrical discharge machining of M2 tool steel

Mukandar Sekh, Ziyauddin Seikh, Souren Mitra, Soumya Sarkar, Bijoy Bhattacharyya

Pages 1303-1311

Article preview 

Abstract

Abstract

A detailed experimental research study on wire lag phenomena, gap force, and wire lag compensation has been carried out on M2 tool steel material to overcome the error in dimensional accuracy for circular or curved profile job cutting in the wire electrical discharge machining. The design of experimental planning was made based on Taguchi methodology to determine the effect of the WEDM input control parameters on the wire lag related to different machining criteria, as well as the material removal rate, surface finish characteristic in terms of Ra values, spark gap, and specific energy consumption in this research work. The frequency, pulse on time, peak current, wire feed, workpiece height and wire tension, cutting diameter, and the span in between wire guide and job surface are considered as input control parameters for the present study. Parametric analysis shows that wire lag increases with workpiece height and wire lag compensation

Research article Abstract only

Article preview 

Abstract

Abstract

The major challenge during welding of advanced high strength steels (AHSS) is finding an appropriate low cost filler wire which minimizes the softening in the heat affected zone (HAZ). The fabricators always prefer undermatching wires to join the thinner sections. This study reports the differences in the microstructure and mechanical properties of Ti-Nb microalloyed steel prior welded using pulse gas metal arc welding (P-GMAW) and standard gas metal arc welding (GMAW). The results indicate that the microalloyed steel welded using P-GMAW has inherent advantage over the standard GMAW. The pulses intensified the vibration perturbation in the weld puddle which cause microstructural refining and increased formation of the acicular ferrite (AF) constituent. The higher percentage of AF present in the weldment resisted propagation of the crack during static tensile test. Microhardness, ultimate tensile strength and joint

Research article Abstract only

Structural and morphological properties of bismuth telluride nanoparticles synthesized by two-step hydrothermal method

N.S. Abishek, K. Gopalakrishna Naik

Pages 1319-1322

Article preview 

Abstract

Abstract

Bi_2Te_3 nanomaterials have been synthesized using the two-step hydrothermal method at 160°C . The structures and morphology of the samples were characterized by X-ray diffraction (XRD), Field Emission Scanning Electron Microscope (FESEM), High Resolution Transmission Electron Microscopy (HRTEM) and Selected Area Electron Diffraction (SAED). The growth mechanism of the grown of Bi_2Te_3 nanostructures has been discussed.

Research article Abstract only

Article preview 

Abstract

Abstract

Single crystals of intrinsic strontium L(+) tartrate pentahydrate (IST) and cobalt-doped strontium L(+) tartrate pentahydrate (CoDST) are grown by gel diffusion technique with the growth parameters optimized to lab temperature of 23.5°C. Stoichiometric composition and the cationic distribution of the crystals are determined from EDAX technique. FTIR and Raman spectral analyses reveal the presence of water molecules, O–H, C–H, C–O, C=O and C–C bonds in the crystals. Thermogravimetric analysis confirms that the crystals attain thermal stability in oxide state through four stages of decomposition, undergoing weight loss in each stage. This study also reveals the pentahydrate nature of both the crystals. While IST crystal material possesses a chemical formula: $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 5\text{H}_2\text{O}$ with a molecular weight of 325.77, the CoDST crystal is seen to possess a chemical formula: $\text{Sr}_{0.999}\text{Co}_{0.001}\text{C}_4\text{H}_4\text{O}_6 \cdot 5\text{H}_2\text{O}$ with a molecular weight of

Research article Abstract only

Development of an ammonia gas sensor employing an inter-digital capacitive structure coated with $\text{Mn}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ nano-composite

Jiss Paul, Jacob Philip

Pages 1331-1336

Article preview 

Abstract

Abstract

Sensing toxic gases in the atmosphere is a great challenge since the selectivity of the sensor for the desired gas should be high enough to detect the particular gas at the ppm level. This work presents $\text{Mn}_{0.5}\text{Zn}_{0.5}\text{Fe}_2\text{O}_4$ nano-composite vacuum deposited over an inter-digital capacitive (IDC) structure as an ammonia gas sensing material. The synthesized material is characterized by X-ray diffraction (XRD), Transmission Electron Microscopy (TEM) and Fourier Transform Infrared spectroscopy (FT-IR) to substantiate the crystalline structure and surface morphology of the material. The gas sensing properties of the IDC sensor for ammonia gas are investigated at room temperature. High sensitivity even at extremely low ammonia

Performance of ternary blend SCC with ground granulated blast furnace slag and metakaolin

S.S. Vivek

Pages 1337-1344

Article preview 

Abstract

Abstract

Self Compacting Concrete (SCC) is of immense use in the concrete industry where access was restricted for concreting and building components with congested reinforcements. In this paper, a sincere attempt was made to develop SCC using the ternary mix. Industrial waste namely Ground Granulated Blast furnace Slag (GGBS) (from 30 to 50%) and the other material Metakaolin (MK) (from 5 to 15%) was used as a replacement to cement in different combinations to produce SCC with better performance. In this present research paper, studies on X-ray diffraction, rheological and mechanical properties were studied for ternary SCC mix containing MK and GGBS. The ternary SCC mix (S1) containing 5% MK and 30% GGBS had shown improved compressive strength characteristics among ternary SCC mixes, control SCC and conventional vibrated concrete mixes. The ternary SCC mix (S7) also had higher tensile strength characteristics concerning control

Research article ○ Abstract only

Effect of CNT content on microstructure and hardness of AlSi/MWCNT nano composite

Azeem Pasha, B.M. Rajaprakash

Pages 1345-1350

Article preview 

Abstract

Abstract

The utilization of aluminum alloy grows rapidly in automobile and aerospace industries due to its low weight to high strength. Going a step further, with the process of reinforcing MWCNT (multi walled carbon nanotubes) gives better properties with an observable decrease in its overall weight. In the present investigation, increasing of CNT wt% with ball milling time on hardness and micro structure of metal matrix composite is studied. Multi wall carbon nanotubes are mixed uniformly with Aluminum silicon alloy

Research article Abstract only

Investigation on solid state pyrolytic decomposition of bimetallic fumarate and tartrate precursors of Co (II), Ni (II) and Zn (II) with manganese

D.V. Nighot, M.B. Khanvilkar, N.J. Karale, R.A. Pawar, ... A.K. Nikumbh

Pages 1351-1359

Article preview 

Abstract

Abstract

The complexes of Co (II), Ni (II), and Zn (II) with manganese were synthesized by co-precipitation techniques such as fumarates and tartrates. The formation of these dicarboxylate complexes characterized by elemental analysis, infrared spectroscopy, and X-ray powder diffraction studies. The thermal decomposition behaviors of these complexes were investigated using thermal analysis (TGA, DTG, and DTA) and d. c. electrical conductivity measurements under normal atmosphere. Based on conductivity measurements and isothermal studies, a probable mechanism for the decomposition was proposed. After dehydration, the anhydrous complexes decompose to yield respective carbonate intermediate in the temperature range 200 – 350°C. Decomposition of this carbonate species to the formation of the respective spinel in the temperature ranges 350 – 500°C. The infrared spectra and X-ray powder diffraction studies

Research article Abstract only

Analysis and optimization of nozzle distance during turning of EN-31 steel using minimum quantity lubrication

Ajay Kumar, Gurpreet Singh, Vivek Aggarwal

Pages 1360-1366

Article preview 

Abstract

Abstract

Traditional high volume cutting fluid is normally applied during manufacturing of product at shop floor to minimize severity of friction, wear, temperature and machining forces. It impacts the manufacturing

6/22/24, 2:43 PM Materials Today: Proceedings | GC-RASM, 2021 | ScienceDirect.com by Elsevier

the environment, machine, materials, human and costly too. Hence, for ensuring the economy and ecology of machining process the high discharge rate of cutting fluids should be minimized. Therefore, machining should be conducted in such conditions where the aforementioned limitation should be avoided i.e. dry and minimum quantity lubrication. However, dry machining has limitation at higher levels of input variables so

Research article Abstract only

Exploring potential of glass surface immobilized short antimicrobial peptide (AMP) as antibacterial coatings

Sasmita Majhi, Abhijit Mishra

Pages 1367-1377

Article preview 

Abstract

Abstract

Bacterial infections associated with biomedical devices and implants pose serious clinical threat to human health and medical sector. Antimicrobial peptides (AMPs) based coatings are promising candidate to prevent these infections due to broad spectrum antimicrobial activity, reduced bacterial resistance propensity, and low cytotoxicity. In this study, an *in-house* designed peptide, KLR (KLLRLRKLLRR), is immobilized onto glass substrates and its antibacterial activity against *E. coli* and *S. aureus* is studied. The effect of orientation of the peptide on the antibacterial activity is also tested by tethering the peptide through its C-terminus, using EDC/NHS coupling, and N-terminus, using maleimide-thiol chemical coupling. To confirm successful modification in all the sequential steps, X-ray photoelectron spectroscopy (XPS), water contact angle (WCA) measurements, and atomic force microscopy (AFM) is used. Antibacterial

Research article Abstract only

Structural response of glass fiber reinforced polymer tubes infilled with lightweight aggregate concrete

P. Bhuvaneshwari, S.R. Aravind, Harish Shravan, R. Nigilesh Kanna

Pages 1378-1382

Article preview 

Abstract

6/22/24, 2:43 PM Materials Today: Proceedings | GC-RASM 2021 | ScienceDirect.com by Elsevier
(LWC). The conventional coarse aggregate in concrete was replaced with Pumice aggregate to achieve LWC (R10, R20, R30, R40, R50). The reduction in density using LWC was noticed. To enhance the structural performance of LWC, cement was partially replaced with Ground Granulated Blast Furnace Slag (GGBFS) and Metakaolin (MK) mineral admixtures. LWC without and with mineral admixtures were cast as columns (UC-NMA, UC-MA). The effect of the confinement was noticed by casting similar mixes as infill in Glass Fiber Polymer Tubes (GFRP- C-NMA, C-MA). The axial load - displacement behaviour was compared for columns. Comparison of the results showed that confinement offered by GFRP tubes has highly enhanced the performance of infilled LWC. Parametric analysis shows that R30-MA was the optimum mix to be used

Research article Abstract only

Parametric amplification of acoustical phonons in semiconductor magneto-plasmas: Quantum effects

Devender Singh, B.S. Sharma, Manjeet Singh

Pages 1383-1389

Article preview 

Abstract

Abstract

Using QHD model, the quantum effects (QEs) on parametric amplification of acoustical phonons in semiconductor magneto-plasmas have been investigated. Assuming that the origin of nonlinear interaction lies in nonlinear induced current density of the medium (arising due to density perturbations of the medium) in the presence of pump field, expressions have been obtained for second-order susceptibility of the medium and hence the threshold pump amplitudes (with and without QEs) and as well as parametric gain coefficients (with and without QEs). Numerical analysis has been made for n-InSb-CO₂ laser system. The dependence of these parameters on acoustic wave number, external magnetic field, and doping concentration has been explored. It has been found that the Bohm potential in the electron dynamics reduces the threshold pump amplitude for the onset of parametric amplification four times whereas

Research article Abstract only

Melting phenomena of Cu_{0.25}Ni_{0.75} bimetallic alloy: A molecular dynamics approach

M.P. Samantaray, S.S. Sarangi

Pages 1390-1394

Abstract

Alloys of transition metals draw attention from the scientific community due to the interesting physical and thermal behaviour they exhibit over their pure metal components. Atomic Molecular Dynamics Simulations on Pure copper (Cu) metal, nickel (Ni) metal and their Ni rich alloy ($\text{Cu}_{0.25}\text{Ni}_{0.75}$) have been carried out using the second nearest neighbour modified embedded atom potential parameters to investigate on the melting phenomena of the Ni rich alloy. The variation of average potential energy with respect to temperature is used to estimate the melting point temperature. Various other analyses such as; specific heat, mean square displacement of atoms and self-diffusion coefficients of atoms have been calculated in order to determine the exact transition region in the metals and to mark the melting point temperatures. The results show that the melting temperature of the Ni rich alloy is more as compared to its pure

Research article Abstract only

Experimental analysis on roof construction

N.K. Mandavgade, N.P. Mungle, S.K. Mandavgade, A.N. Mungle, M.D. Muley

Pages 1395-1400

Article preview 

Abstract

Abstract

Global warming is a harsh reality of today's century. All human and animals are facing challenges for survivals. Sometimes challenges are very big. According to the environment and nature's role all of us make the arrangement for the leaving comfort. Undoubtedly, as the ambient temperature increases, the inside and outside temperature of the building also increases. This increase in the temperature affects the living condition of human being as well as other biota. Those who can afford they can use a mechanical system called as Refrigeration and air conditioning system. The green roof top is an idea where the cost cutting is done in the energy consumption and increases the comfort level of the biota. Thus, the overall objective of the paper is to investigate the impact of green roof on thermal performance for Indian climate. The thermal performance of the green roof over conventional roof has been compared for the results. The temperatures

Research article Abstract only

Abstract

Abstract

Nanostructure wrinkle created by amorphous diamond like carbon (a:DLC) thin films on a flexible Polyethylene Terephthalate (PET) substrate via chemical bath deposition technique was studied in detail. Atomic force microscopy (AFM) image revealed that the nanostructure wrinkle pattern with varying wavelengths from 350nm to 170nm are closely spaced and randomly oriented on the PET substrate. Raman spectra analysis showed that the chemical composition i.e., $sp^2/(sp^2+sp^3)$ bonding ratio in the deposited a:DLC nanostructure wrinkle thin films was varied by changing the sucrose weight percentage in the precursor solution used for a:DLC thin film deposition. The optical band gap energy decreased from 3.17eV to 2.04eV for the a:DLC nanostructure wrinkle thin films due to increase the sucrose weight percentage in the precursor solution from 5 to 30 respectively. The disorderness and defect density in the a:DLC

Research article Abstract only

A simple method for the synthesis of anatase-rutile mixed phase TiO₂ using a convenient precursor and higher visible-light photocatalytic activity of Co-doped TiO₂

K. Ambily Jacob, P. Moly Peter, P. Elsa Jose, C. Jeena Balakrishnan, V. Joy Thomas
Pages 1408-1417

Article preview 

Abstract

Abstract

This work reports a novel and simple method for the synthesis of mixed phase TiO₂ (Anatase 70% and Rutile 30%). Refluxing aqueous solution of potassium titanyl oxalate lead to direct crystallization of titanium oxalate complex $[Ti_2O_3(H_2O)_2(C_2O_4).3H_2O]$ and this complex on calcination at 450 °C for one hour yielded TiO₂ powder. The powder samples were characterized by XRD, Raman spectroscopy, FESEM-EDX, TEM, XPS, FT-IR, UV-Visible spectroscopy and BET techniques. The XRD, TEM and Raman spectra of TiO₂ indicates the coexistence of anatase and rutile phases. The XRD result shows that the primary particle size of anatase crystals is 8.3nm and that of rutile crystals is 35nm. From the UV-Visible DRS spectrum, the bandgap of TiO₂ was found to be 3.0eV. Co-doped TiO₂ (Co:Ti ratio 1:99) was prepared by adding cobalt nitrate to the

Sita Ram Sharma, Jai Chand Mehalwal, Dinesh Kumar Sharma
Pages 1418-1422

Article preview 

Abstract

Abstract

Herein, the study of present paper concentrates on the vibrations of rigidly fixed electro-magneto nonlocal elastic voids cylinder with generalized thermoelasticity. The surfaces of nonlocal elastic hollow cylinder have been assumed isothermal/thermally insulated and rigidly fixed. For the investigation of the vibrations of rigidly fixed boundaries, we make use of numerical Iteration method using MATLAB tool. The real parts of generated data have been considered natural frequencies as shown in table. Numerical computations in local/nonlocal elastic materials for free vibration field functions have been displayed graphically.

Research article Abstract only

Microstructure evolution and phase transformation of ZrB_2 - ZrO_2 - $MoSi_2$ -Al coating during annealing treatment

M. Kovaleva, I. Goncharov, V. Novikov, M. Yapryntsev, ... O. Kolisnichenko
Pages 1423-1425

Article preview 

Abstract

Abstract

To achieve oxygen blocking structure on surface of carbon/carbon composites, ZrB_2 - ZrO_2 - $MoSi_2$ -Al coating was prepared by a multi-chamber detonation accelerator. As-sprayed coating consisted of t- $MoSi_2$, h- ZrB_2 , m- ZrO_2 , t- ZrO_2 , and c-Al. A uniform distribution of ceramic c- ZrO_2 particles and the formation of h- $(\alpha-Al_2O_3)$ are observed in the coating at 1400°C, which increases the stability of the coating. The structure of coating surface exhibited a without pore and cracks after annealing. The results indicated that a ZrB_2 - ZrO_2 - $MoSi_2$ -Al composition

The use of entropy-based GRA approach to analyze and optimize the wire electrical discharge machining process for Nitronic-30

Nilesh T. Mohite, Geetanjali V. Patil, Anupama N. Kallol

Pages 1426-1430

Article preview 

Abstract

Abstract


Efficient and cost effective utilization of WEDM process is a challenge for leading edge era of manufacturing because of the complex and non-linear behavior of the process. The current study focuses on an experimental inquiry carried out for WEDM of Nitronic-30 to obtain optimum process parameters for improved surface roughness (SR) and material removal rate (MRR), Nitronic-30 is austenitic stainless steel offers high strength with good corrosion resistant property which high potential in applications such as automotive parts, aqueous applications, solid handling equipment. Therefore, multi-response optimization of Nitronic-30 on WEDM is very essential. Experiments were carried out with Taguchi's DoE and a L9 orthogonal series, with machining parameters like pulse on time (Ton), pulse off time (Toff), and peak current (IP). Minitab-17 software was used to evaluate response variables such as material removal rate and

Research article ○ Abstract only

Evaluation of solvent transport and cure characteristics of chlorobutyl rubber graphene oxide nanocomposites

H. Sreehari, Asok Aparna, Jitha S. Jayan, A.S. Sethulekshmi, ... Appukuttan Saritha

Pages 1431-1435

Article preview 

Abstract

Abstract

Chlorobutyl rubber (CIIR) is a significant type of synthetic rubber with interesting properties and thereby finds applications in numerous filed. Insertion of nanofillers like organo clay, carbon nanotubes, graphene etc. into CIIR matrix reduces the permeability which is useful for the synthesis of membranes with less solvent and gas

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percentage of uptake was observed with increase in temperature. This study clearly shows the ability of GO in
CLIR matrix to prevent the solvent transport through the polymer, which opens its application in chemical
protective clothing.

Research article Abstract only

In Vitro study of green synthesized ZnO nanoparticles on human lung cancer cell lines

Nutan Rani, Kavita Rawat, Anju Shrivastava, Ekta, ... Kalawati Saini

Pages 1436-1442

Article preview 

Abstract

Abstract

This paper presents green synthesis of ZnO nanoparticle (L1-NPs) using extract of leaves of *Azadirachta indica* (Neem tree) Characterizations of synthesized L1-NPs have been done by UV-Visible spectroscopy, FTIR, powder x-ray diffraction (PXRD), Scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), field emission scanning electron microscopy (FE-SEM). The effect of synthesized nanoparticles on viability of human lung adenocarcinoma (A549 cells) have been determined using MTT assay. The viability of A549 cells have been significantly decreased by ZnO NPs synthesized with leaves extract as well as only extract (OE) of leaves of *Azadirachta indica* (Neem tree) in a dose-dependent manner. In addition, we have observed that the cell viability could be significantly reduced with an incubation period of 48h at 100, 150 200 and 250µg/ml. The IC₅₀ value for zinc oxide nanoparticles prepared with 1ml of leaves extract (L1-

Research article Abstract only

3D concrete printing matrix reinforced with Geogrid

S. Geetha, M. Selvakumar, S. Muthu Lakshmi

Pages 1443-1447

Article preview 

Abstract

Abstract

the conventional method, like in the cost of the project is majority synonymous to the use of formwork. And this is added up with a list that includes Safety issues, usage of 3D printing, time delay, space constrain, labour problems, etc. The aforementioned subjects can be made effective with the application of 3D Printing Techniques in Concrete Technology. This Paper targets on optimizing the mortar mix for 3D Printing Concrete with adaptable mineral and chemical admixtures. Use of accelerators reduced the final

Research article Abstract only

Chromium oxide regulated nanoparticles biosynthesis in Manihot esculenta leaf extract

K. Thara, Ignatius Navis Karthika, C. Ramesh, M.S. Dheenadayalan

Pages 1448-1452

Article preview 

Abstract

Abstract

The green synthesis of nanoparticles using plant extracts plays an important role in the field of nanotechnology. The potential of biomolecules present in plant extracts in reducing metal ions to nanoparticles in a single step of green synthesis process is very important. In this study we report on synthesis of Chromium oxide nanoparticles (Cr_2O_3) by reduction of potassium chromate solution with Manihot esculenta leaf extract. The presence of water soluble carbohydrates which have an aldehyde group may lead the formation of Cr_2O_3 nanoparticles. The fabricated Chromium oxide nanoparticles were confirmed by UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier transform-infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM). XRD and UV-Visible absorption studies. The images showed that the size of NPs of Cr_2O_3 varied with average crystalline size 85–100 nm of nanosized Cr_2O_3 .

Research article Abstract only

Dislocation and deformation analysis of Cu-Ni thin films during Nano-indentation using molecular dynamics simulation approach

Anil B. Shinde, Shivanjali Patil, Pooja Patil, Rohit Salunkhe, ... Vijay Patil

Pages 1453-1461

Article preview 

Abstract

of nano-coating on hardness and dislocations. The dislocation mechanism, common neighbour analysis in Cu-Ni, is analysed by changing the distinctive parameters of indentation using molecular dynamics simulation approach. Overall indentation impact and mechanisms are studied with indentation velocity, indenter radius, and Nickel layer thickness. The embedded atom method based potential is used to describe the interaction between atoms. From the analysis it was seen that by applying varying thickness of nano-coating of nickel over a copper substrate, the hardness value increases corresponding with force as the thickness of nickel coating increases. Cu-50Ni is having more value of harness, which is 43% higher than pure Copper. The total length of dislocations for Cu-50Ni was 5% and 20% less than Copper and Cu-20Ni

Research article Abstract only

Design of a 6-DOF robot manipulator for 3D printed construction

Md. Hazrat Ali, Yernar Kuralbay, Aidos Aitmaganbet, M.A.S. Kamal

Pages 1462-1468

Article preview 

Abstract

Abstract

Robotics and their application in industrial automation are increasing over the decades. There are a variety of conventional and non-conventional applications of robotic manipulators. One example of the non-traditional application of robot manipulators is the 3D printing-based construction of houses and buildings. Up to date, different ambitious solutions and methods are proposed, and they are expanding fast. In large-scale production, 6 DOF robotic arms, designed by common manufacturers such as KUKA, DENSO are widely used in 3D construction. The main objective of this work is to model a 6 DOF robot manipulator for 3D printing-based construction technology. This paper presents two new designs of robot manipulators for construction purposes; one is to transport the building materials, and the other is to help print with the concrete mixtures. The simulation results are obtained applying fundamental theories of robotics through

Research article Abstract only

Synthesis and characterization of manganese doping on NiO nanoparticles and its supercapacitor applications

S. Sivakumar, Nazir Ahmad Mala

Pages 1469-1474

Abstract

In this study, bare nickel oxide (NiO) and Mn²⁺ doped NiO nanoparticles (NPs) were prepared through the precipitation method. Samples were analyzed by XRD (X-ray diffraction), FT-IR (Fourier-transform infrared spectra), SEM (scanning electron microscope), EDX (energy dispersive X-ray analysis), and CV (cyclic voltammetry) techniques. The XRD result indicates that the obtained samples of bare and doped NiO NPs show a face-centered cubic structure. SEM images established that the bare NiO NPs and Mn²⁺ doped NiO have a spherical shape. The formation of the NiO phase was confirmed by the existence of a peak at 436 cm⁻¹ in FTIR. Electrochemical properties of bare and Mn²⁺ doped NiO NPs were investigated regarding their performance as an electrode in supercapacitors. The highest specific capacitance shows on bare NiO electrode 555 Fg⁻¹ at 10mVs⁻¹ scan rate, it shows that is a good electrode material for the supercapacitor

Research article Abstract only

Experimental comparative study of banana fiber composite with glass fiber composite material using Taguchi method

Boopathi Sampath, N. Naveenkumar, P. Sampathkumar, P. Silambarasan, ... M.Sakthivel

Pages 1475-1480

Article preview 

Abstract

Abstract

In this research, the mechanical properties of banana and glass fiber reinforced epoxy composite is examined. The unidirectional banana and glass fiber composite are produced using the hand lay-up method. The Tensile strength and fracture toughness are measured to compare their mechanical characteristics. The thickness, length, and percentage of fiber volume fraction have been considered as the process parameters. The experiments were conducted using Taguchi L9 orthogonal array. The analysis of variations is conducted to find the significant parameters and contribution of parameters. It was found that the volume fraction of fiber with matrix polyester has a higher contribution than other factors. It is also observed that the tensile strength and fracture toughness of glass fiber reinforced composite is 36.54% and 33.34% higher than banana fiber composite respectively

Research article Abstract only

[Article preview](#) 

Abstract

Abstract

The high purity crystalline CoFe_2O_4 nanomaterials were prepared by a sol-gel derived facile route at 800°C for 3 hrs. XRD, SEM, FTIR spectroscopy, PL analysis, Uv-Visible spectroscopy, VSM and precision multiferroic system were used for characterizations of the material. XRD identified the development of the cubic phase with a crystallite size of 25.68nm. The wavenumbers of molecular vibrations were detected using FTIR spectroscopy between 464 and 3440cm^{-1} , where Fe-O at 464cm^{-1} and Co-O bond at 579cm^{-1} point to the spinel phase yield of CoFe_2O_4 . The direct and indirect band gap was found to be 3.88 and 3.80eV, respectively. The PL spectroscopy revealed emission wavelengths between 457 and 519nm at room temperature. The annealed nanoparticles were observed with a mean grain size of approximately $1.86\mu\text{m}$ by SEM analysis. The magnetic constraints like coercivity (H_c), M_s (saturation magnetization), retentivity

[Research article](#)  [Abstract only](#)

Effect of water pressure and temperature on spherical float of level sensing auto drain valve

S. Sundararaj, P. Krishnakumar, V.R. Anirudh, L. Chetan Shikhar, ... V. Vijay

Pages 1490-1497

[Article preview](#) 

Abstract

Abstract

A float detects the level of a liquid in a tank or a container. It floats on top of the liquid surface and acts as a mechanical switch when the water moves up or down in the auto drain valve tank. The auto drain valve removes the water in the compressed air circuit. The spherical float used in the auto drain valve is prone to the realization of a dent and the float joint fails due to the high pressure of air in the compressed air circuit. In this paper, the spherical float was analysed numerically to select the suitable stainless steel materials out of SS 302, SS 305, SS 312, SS 316 to withstand the high-pressure force and temperature of the air in the drain valve. The applied pressure was varied from 0.7 to 2.0MPa and the temperature from 2°C to 80°C based on the drain valve application. The structural analysis results obtained were the total deformation,

Santosh A. Kadapure, Umesh B. Deshannavar

Pages 1498-1503

Article preview **Abstract****Abstract**

Microbial self-healing is an innovative technology which repairs cracks in concrete by precipitation of calcite. The main focus of our research study was focused on evaluating the performance of synthesized microbial agent with *Bacillus sphaericus* (spore forming urelotic strain) of cell dosage 10^5 cells/ml in repairing cracks in fly ash concrete. The bio-based agent is added to cracks in fly ash concrete. The effectiveness of prepared bio- based agent in repairing the cracks in concrete was assessed by comparing with non-based agent prepared with cement, sand and water. The mechanical and water absorption property are evaluated. The compressive strength and water absorption of micro-repaired concrete was found to increase by 10% and 6 % in comparison with non micro repair concrete. Scanning electron microscope analysis of concrete samples was done to confirm formation of calcite. The analysis showed

Research article Abstract only**Third order measurements, thermal and mechanical stress tolerance studies of a nonlinear borate family hybrid crystal towards optoelectronic applications**

M. Divya, G.B. Anushya, A. Joseph Arul Pragasam, G. Vinitha, P. Malliga

Pages 1504-1510

Article preview **Abstract****Abstract**

Highly transparent nonlinear Thiourea cadmium hydrogen borate (TCHB) single crystal grown by slow evaporation method is investigated for optoelectronic applications. Single crystal XRD provides details about the lattice structure. FTIR vibrational spectroscopic study identifies the functionals that make up the crystal system. Elemental composition is determined from the EDAX spectrum. UV spectral analysis is performed to determine the transparency range, absorption edge limit, and band gap value at which the

Research article Abstract only

Durability and micro-structure studies on fly ash and silica fume based composite fiber reinforced high-performance concrete

Sachin Patil, H.M. Somasekharaiah, H. Sudarsana Rao, Vaishali G. Ghorpade

Pages 1511-1520

Article preview 

Abstract

Abstract

In this investigation, cement was partially replaced by combined fly ash and silica fume. Glass fibers and polypropylene fibers were added to produce high-performance concrete. This high-performance concrete was investigated to resist HCl and $MgSO_4$ acid attacks for 30, 60, and 90 days. The water to binder ratio of 0.275 and an aggregate to binder ratio of 1.75 were adopted. Fly ash and silica fume were replaced in the range from 0% to 15% each, glass fibers were added in volume percentages from 0% to 1%, and polypropylene fibers were kept constant at 0.25%. The development of cost-effective state-of-the-art procedures for producing, evaluating, and designing with this concrete will enhance the performance for each performance characteristic and can be reliably achieved in the field. The combined effect of fly ash and silica fume at 5% each as replacement of cement and the addition of composite fiber dosage of glass

Research article Abstract only

Mathematical modeling of various forces acting on piston rod packing rings

Rahul Nile, Utsav Verma, Abhijeet Deshpande, Sumit Joshi, ... Atul Kulkarni

Pages 1521-1526

Article preview 

Abstract

Abstract

Piston rod packing, a critical part of compressor provides dynamic sealing surrounding the piston rod. Typically, casings with one or more rings in each, are bolted to the cylinder head using the flange for providing effective sealing. During operation the packing rings are subjected to cyclic loads under high

6/22/2022 11:42 AM
designed. In this paper an attempt is made to develop a mathematical model of variations of force and pressures acting on packing ring with respect to crank angle. The paper also illustrates the approach for calculation of axial and radial thickness. Distorted profile predicted using the given Fourier series can be

Research article Abstract only

Combined effect of metakaolin and hybrid fibers on the strength properties of high performance concrete

Adanagouda, H.M. Somasekharaiah, M.S. Shobha, H.M. Mallikarjuna

Pages 1527-1536

Article preview 

Abstract

Abstract

This study aims to investigate the combined effects of Metakaolin (MK) and Hybrid fibers on High-Performance Concrete's (HPC) mechanical properties. A constant proportion of 0.25% for polypropylene fibers (PF) and varying proportions of 0%, 0.5%, 0.75% and 1.0% for steel fibers (SF) making a total fiber volume fractions of 0%, 0.75%, 1.0% and 1.25% were used to develop hybrid fiber-reinforced high-performance concrete (HFRHPC). Four replacement levels for hybrid fibers by volume of the binders and four partial replacement levels for Metakaolin (0%, 10%, 20% & 30%) by weight of cement have been considered for three different water binder ratios (0.275, 0.325 & 0.375). An aggregate binder ratio of 1.75 was kept constant. The test results reveal a maximum increase of 31.83%, 37.05%, and 36.53% in compressive strength for curing periods of 7, 28, and 56 days, respectively. The split tensile strength, flexural strength

Research article Abstract only

Improvement of California Bearing Ratio value in weak subgrade soil with the developed anchored geogrid

Balamaheswari M, Anitha B, Kanimozhi B, Naganatha Prabhu L

Pages 1537-1542

Article preview 

Abstract

Abstract

determine the optimum placement depth in the CBR mould. The modified geogrid with anchors positioned at the optimum placement depth for which the CBR value is 6.00 compared to the CBR value of 4.68 for the reinforced condition. The inclusion of anchors in the geogrid results in enhancing CBR value for the reinforced condition to a percentage improvement of 95%.

Research article Abstract only

Recycled substance evaluation and effect on fire resistance structures

Arigela Surendranath, P.V. Ramana

Pages 1543-1549

Article preview 

Abstract

Abstract

The dimensions $0.3 \times 0.3 \times 0.1$ m, composed by the reinforced concrete (RC), prestressed concrete (PC), and Polypropylene reinforced concrete (PRC) and 28 days the strength & precise temperatures measured along surfaces. Mathematical models were planned to forecast concrete strengths when acquainted with thermal flare because numerous mechanical tests like compressive, tensile, flexural strengths and density are performed. Mechanical properties of various mixes of concrete beneath the effect of fireplace flame exposure are presented. Three distinct concrete mixes are prepared. The Bi-material concrete parts were subjected to fireplace flame temperatures travel from room temperature (27°C) at completely different ages of thirty, sixty and ninety days. At numerous heat levels of 400°C , 600°C and 850°C were elected to exposure length of 2 0h. When the hearth performance, concrete specimens were quenched in an

Research article Abstract only

Bending response optimization of an ionic polymer-metal composite actuator using orthogonal array method

Dillip Kumar Biswal, Bikash Ranjan Moharana, Tara Prasad Mohapatra

Pages 1550-1555

Article preview 

Abstract

Abstract

6/22/2024, 11:24 AM
dynamic sensors and underwater propulsion systems. Today, producing large bending actuators with low voltage sources and biocompatibility, IPMCs are receiving more and more attention to many researchers in recent days. To reduce the experimental costs, the principal factors which are responsible for more bending response are designed in this work using Taguchi orthogonal array method. Multiple process parameters include input voltage and thickness of the fabricated Ag-IPMC actuator was optimized to produce a maximum bending response. Experiments were carried out using L9 orthogonal array to recognize the

Research article Abstract only

Development of green geo-adsorbent pellets from low fire clay for possible use in methylene blue removal in aquaculture

Priyanka Sharma, Aramide Fatai Olufemi, Kushal Qanungo

Pages 1556-1565

Article preview 

Abstract

Abstract

Mesoporous clay ceramic pellets have been prepared by sintering silica rich low fire clay at two different temperatures (650 °C and 850 °C). The prepared ceramic pellets were characterized using FTIR, SEM, XRF, compressive strength and water adsorption capacity. The methylene blue removal capacity of ceramic pellets was investigated and it was found that the uptake capacity of pellets was found to be increasing with increase in the initial dye concentration, while it was found to be decreasing with increase in pellet dose. Presence of co-ions and change in pH had no effect on the removal capacity. The adsorption isotherm followed the Langmuir model while the adsorption kinetics was well described by the pseudo-second order model. A simple device that can be used in aquariums, made from stainless steel wire mesh containing the ceramic pellets has been described which can slowly yet effectively remove MB from tan water at ultralow

Research article Abstract only

Incinerated municipal solid waste bottom ash bricks: A sustainable and cost-efficient building material

Pravez Alam, Davinder Singh, Sanjeev Kumar

Pages 1566-1572

Abstract

Incineration of Municipal solid waste leads to the generation of bottom ash and fly ash. The applications of fly ash are many, but the bottom ash is usually being disposed of directly to the landfills. The study seeks the application of municipal solid waste incinerated bottom ash in the manufacturing of bricks. Since bottom ash has a high amount of silica, but due to high porosity and less unit weight compared to clay, the direct use of bottom ash is not feasible for brick production. Cement stabilizes the inorganic compounds present in ash and provides the required compressive strength. A series of compressive strength, efflorescence, pH, water absorption, and Ultrasonic pulse velocity tests were performed on eight different mix proportions. OPC 43 grade cement was used to replace 6, 8, 10, 12, 14, 16, 18 and 20% of incinerated bottom ash content by mass. These lightweight bricks fulfill the criteria of minimum water absorption even

Research article Abstract only

Effect of wave shift of porous slab on thermo-hydraulic transport characteristics of laminar flow through a wavy channel

Prince Kumar, K.M. Pandey

Pages 1573-1578

Article preview 

Abstract

Abstract

In the present numerical study, the finite element method is adopted to investigate the thermo-hydraulic transport characteristics of two-dimensional, steady, Laminar flow of Newtonian fluid through partially porous wavy channel. The wavy channel consists a porous wavy slab at the center. Water is taken as working fluid with Prandtl number $Pr=6.93$ and Reynolds number $Re=700$ considered for all simulations. Results are investigated in the form of average Nusselt number (Nu_{avg}), Enhancement ratio (ER), Pressure drop (Δp), Pressure ratio (PR), and Performance factor (PF) for different wave amplitudes ($\alpha=0.06, 0.12, \text{ and } 0.18$) and wave phase shifts ($\varphi=0^\circ, 45^\circ, 90^\circ \text{ and } 180^\circ$) of porous slab at different Darcy numbers range ($Da=10^{-6} \text{ to } 10^{-2}$). Results reveal a significant increment in average Nusselt number with decreasing in Darcy number on the pressure drop penalty. The maximum value of ER found for geometry configuration

Research article Abstract only

Article preview 

Abstract

Abstract

Thermophysical analysis of acrylic pyramid solar still with and without Zn^{2+} substituted Cr_2O_3 nanoparticles had been analysed. Synthesised pure and Zn^{2+} doped Cr_2O_3 nanoparticle with different dopant concentrations is used along with the black absorber paint as an additional source in enhancing the heat transfer in the solar still. Heat transfer modes, efficiency (instantaneous and overall) and thermophysical properties are predicted for solar still with and without Zn^{2+} substituted Cr_2O_3 nanoparticles.

XRD confirms the rhombohedral phase with average particle size of pure and Zn doped Cr_2O_3 around ± 14 nm and ± 12 nm respectively. Surface morphology showed nearly spherical shape with loosely

Research article Abstract only

Numerical simulation to evaluate the thermal performance of engine cylinder Fins: Effect of fin geometry and fin material

Chandrakant R Sonawane, Pratyush Rath, Nishant Vats, Shreyas Patekar, ... Anand Pandey
Pages 1590-1598

Article preview 

Abstract

Abstract

The engine is the most important part of an automobile and it is necessary to keep it in working condition for all kinds of temperature conditions. The heat generated inside the combustion chamber needs to be removed to protect the engine from thermal damages and breakdown, in the same instance it is also necessary to make sure that it holds the temperature at an optimal requirement for combustion to take place. The cooling efficiency of the fins is subjected to many factors such as the wind velocity, ambient temperature, fin geometry, material of the fin, and the exposed surface area. Although few parameters cannot be controlled, the engine manufacturer intends to manipulate all possible factors, like fin thickness,

Finite element analysis of polymeric and cementitious materials to secure cracks in concrete

Rahul Goushis, K.M. Mini

Pages 1599-1606

Article preview 

Abstract

Abstract


Concrete structures are rigid in nature with high load carrying capacity but brittle nature. The volumetric changes that occur in concrete due to various reasons such as shrinkage during construction to chemical exposures and thermal stresses at later stages results in the formation of cracks in concrete. Cracking is the onset of distress in concrete and should be fixed at earlier stages to avoid rapid deterioration of the structure. Concrete and mortar are not a viable solution to fix cracks, as they do not bond with the old concrete resulting in low finishing strengths. Materials such as epoxy, hydraulic cement, polyurethane and acrylic modified mortar have high adhesion to concrete and hence can be used to repair concrete structures. This paper reports an extensive study on the behaviour of epoxy, hydraulic cement, polyurethane and acrylic resin modified mortar in their effectiveness as crack filling materials when

Research article ○ Abstract only

Investigation of dielectric properties and ferroelectric phase transition in lead-free AgNbO_3

Aditya Joshi, S.C. Bhatt

Pages 1607-1609

Article preview 

Abstract

Abstract

Dielectric materials based on AgNbO_3 show application capabilities in a broad range of electronics applications. This study looked into the dielectric and ferroelectric phase transitions of AgNbO_3 . The dielectric and ferroelectric phase transition dominates the temperature and electric field-based performance of AgNbO_3 ceramics, which has a significant impact on its properties. The results of this study suggest that, at room temperature, XRD characterization of sintered samples for phase investigation

Research article Abstract only

Numerical simulation of Savonius rotors used for low wind speed application

Chandrakant R Sonawane, Yogini Sasar, Moiz Shaikh, Yash Kokande, ... Anand Pandey

Pages 1610-1616

Article preview 

Abstract

Abstract


Traditionally wind energy is popularly harvested using large horizontal axis wind turbines however there performance is found to be limited for unsteady and low-speed wind flow conditions. On contrary, vertical axis wind turbines are found to be superior for low wind speed conditions, which are generally found in crowded urban areas. This paper aims to present a design and numerical analysis of a vertical axis wind turbine that can be used in small-scale urban applications like wind trees. Hence in this paper, to absorb maximum wind energy available, we have selected wind tree applications for which three types of vertical axis rotor design are numerically studied. A Computational Fluid Dynamics simulation is performed on three different geometrical configurations: Savonius helical bach rotor, simple Saonius rotor, and simple bach rotor to predict their performance. The coefficient of power, coefficient of moment, and power

Research article Abstract only

Influence of the properties of *p*-a-Si:H layer and the work function of front contact on silicon heterojunction solar cell performance

Niveditha Nair, Varsha T. Babu, Archana Udayan, Parvathy K.S., ... Sanjay K. Ram

Pages 1617-1624

Article preview 

Abstract

Abstract

Heterojunction c-Si and hydrogenated amorphous silicon (a-Si:H) devices with intrinsic a-Si:H thin layer, known as HIT solar cells, are promising alternatives to conventional c-Si solar cells for the possibility of higher open circuit voltage, low temperature processing and lower costs. We have studied the influence of the

Research article Abstract only

Study of radiation shielding materials on microstrip patch antenna for sustainability

John Colaco, Rajesh B. Lohani

Pages 1625-1630

Article preview 

Abstract

Abstract

The development of high-frequency wireless communication like 3G or 4G via microstrip patch antennas made of copper subject material has driven the emanation of harmful ionizing electromagnetic radiations as copper is a particularly extremely high electromagnetic conducting material. This radiation has a high effect on the environment which will motive life-threatening to humans, and the natural world. Moreover, the mentioned radiation due to upcoming ultra-high frequency 5G wireless communication will decline the life of humankind and the surroundings causing more rise in Global warming because of heating of earth's atmosphere through combos of ultraviolet (UV) waves, X-rays, Gamma Rays and RF waves as these waves in assortments will generate electromagnetic heat waves at super-high frequencies. In this research study, using Feko software, the authors have designed, examined and compared microstrip patch antennas made

Research article Abstract only

DSSC using *Wrightia tinctoria* (Roxb.) R Br.: A trail

U. Malavika Lakshmi, Aruna Raj, Jishad A. Salam, R. Jayakrishnan, ... V. Biju

Pages 1631-1636

Article preview 

Abstract

Abstract

This paper focuses on the structure of Dye Sensitized Solar Cell (DSSC) engineered using Titanium dioxide (TiO₂) nano-particles sensitized by extract from leaves of *Wrightia tinctoria* (Roxb.) R. Br. TiO₂ thin films are

absorption and emission spectroscopy studies. A DSSC of the configuration (Cu|TiO₂|Dye(*danthapala*)|KOH(Electrolyte)|FTO) was engineered. The electrical parameters of the engineered Dye Sensitized Solar Cells were characterized. The two-diode model was used to extract the

Research article Abstract only

Design optimization of strain gauge mounting cross section length of strain gauge balance component for wind tunnel application

I.M. Hanapur, S.S. Hiremath, N.R. Banapurmath, V.S. Yaliwal, P.A. Harari
Pages 1637-1645

Article preview 

Abstract

Abstract

The main purpose of this study is to optimize strain gauge mounting cross section length of strain gage (gauge) balance component to measure forces and moments experienced by test models. This is done by using three dimensional models of balance component using version NX 10.0 unigraphics software and the results are analysed using high- fidelity finite element modelling altair hyperworks software version13.0 and optistruct solver. It may be noted that a maximum diameter of 25mm and 200mm length is permitted for strain gauge balance component design. The material used for calculation of the balance component is maraging C-250 steel with maximum yield stress of 1655N/mm². It is very important that designer is supposed to choose the strain gauge mounting cross section length by considering the limits of the design. Distance between front and aft loading location is specifically 100mm. The present work involves design of

Research article Abstract only

UV-Vis absorption spectroscopic analysis of Er³⁺ ion doped oxyhalide glasses

G. Chandrashekaraiiah, C. Narayana Reddy, V.C. Veeranna Gowda, K.J. Mallikarjunaiah
Pages 1646-1649

Article preview 

Abstract

Abstract

some optical properties of oxyhalide glass system $60\text{B}_2\text{O}_3 + 30\text{Li}_2\text{O} + x\text{Er}_2\text{O}_3 + 10 - x\text{BiCl}_3$. With x changing from 0.1 to 0.5 mol % utilizing UV-Vis absorption spectra and the band gap was calculated utilizing Tauc plot relation. In these networks carry out direct and indirect permitted optical band gap energies (E_g). These outcomes show that, E_g decreases with the addition of Er^{3+} ions oxyhalide glasses content. Several proposed relationships for the refractive index and band gap energy for various compositions are discussed. Utilizing distinctive theoretical models, a suitable relationship is identified for the composition studied in

Research article Abstract only

Experimental investigation on compression strength of EPOXY/PVC blend with different fibre glass reinforcements

Mohammed Raffic N., Ganesh Babu, Rajasekaran Saminathan, Afaf M. Babeer, ... Akshay Y.P.

Pages 1650-1657

Article preview 

Abstract

Abstract

Polymer matrix composites with different fibre glass reinforcements like wool, woven ring and mesh has been prepared through hand layup method for the experimental investigation on compression strength and weight evaluation. EPOXY/PVC blend has been used as matrix material with different weight percentages of PVC such as 5%, 15% and 25%. The prepared specimen has been subjected to heat treatment in a oven for different timing such as 15, 30 and 45 min. The present study considers the percentage of PVC, fibre glass type and heating time as input factors to observe their effect over weight and compression strength of the specimen through Taguchi's L_{27} Orthogonal array. The statistical analysis of experimental results through signal to noise ratio method and ANOVA reveals that the type of fibre used for making the specimen has more influence over both the output parameters. The heat treatment provided to the specimen and the

Research article Abstract only

Utilization of plastic waste and ProsopisJuliflora Ash in making floor tiles

V. Raguraman, Manisha Shewale, Pavankumar Korke, Shraddha Asalkar, ... R. Gobinath

Pages 1658-1663

Abstract

Plastic bottles are a large part of the increasing population in the 1940s. It takes hundreds of years for petro-chemical based compounds to decompose. The process of dumping plastic waste is a huge problem and also harmful to the environment. Plastic products are one of the major sources of pollution for land and water. Dumping of plastic waste is a critical problem. To overcome these effects, solid waste management can be used in the construction area. By placing the cement with Prosopis Juliflora ash the side effects caused by cement can be reduced. Solid waste such as crushed plastic and Prosopis Juliflora Ash (PJA) can be used in concrete production. Prosopis Juliflora, a persistent weed that has spread widely over the past 150 years, has been an environmental issue in various parts of the world, including India. Because of its environmental and economic effects in Africa and India, Prosopis Juliflora has been confirmed as a deleterious plant. It can

Research article Abstract only

Low temperature synthesis and influence of Ce³⁺ substitution on structural and magnetic properties of nanocrystalline cobalt ferrite using citrate precursor sol-gel method

Gaurav Kumar, Rakesh Kumar Singh, Singh Sonu Kumar, Aniket Manash, ... Om Priya

Pages 1664-1669

Article preview 

Abstract

Abstract

Rare earth element Ce³⁺ substituted spinel cobalt ferrite, CoFe_{2-x}Ce_xO₄ for (x=0.0, 0.05, 0.10, 0.15, 0.20) is synthesized using an economical sol-gel technique. The X-ray diffraction analysis reveals that all samples have spinel symmetry indexed to *Fd3m* space group. Fullprof Rietveld analysis is performed to find out lattice parameters that increase monotonically due to induced lattice strains in samples. The crystallite size was determined to be 54.9nm using Williamson-Hall plots. The morphological analysis of samples has been performed using SEM imaging. FTIR spectrum confirms octahedral and tetrahedral site occupancy by metal-oxygen bonds for all samples. The magnetic properties of samples refine with Ce³⁺ doping at iron site, with magnetization ranging from 23.59 to 57.68emu/g and retentivity 17.14 to 24.08emu/g. The Coercive field values drastically increased from 739 to 1912 Gauss. Thus, we have explored the influence of

Research article Abstract only

Article preview 

Abstract

Abstract

A numerical study has been carried out to know the lateral torsional buckling of hot rolled steel I beam strengthened using steel plate at the bottom flange. A linear and non-linear analytical study has been carried out using Abaqus software to know the behaviour of beams. For this analysis, ISMB500 is strengthened using a steel plate by varying the thickness of the steel plate. Welded connection is used for connecting the steel plate and bottom flange of a steel beam. The research work aims to determine the ultimate bending strength of the unstrengthened and strengthened I beam. The load deflection behaviour of strengthened and unstrengthened beams was also studied in this research work. Strengthening of steel beam using a steel plate significantly increases the load carrying capacity of steel I beam between 6% and 22%. The percentage of increasing load carrying capacity is depend upon the thickness of plate

Research article Abstract only

Configuration of phosphorus doping in silicene nanoribbons in the presence of an external electric field

Hoang Van Ngoc

Pages 1674-1679

Article preview 

Abstract

Abstract

Silicene nanoribbons have been studied a lot in recent years, it is a nanostructure with enormous applications. The doping of another element into the unit cell changes the electrical and magnetic properties of the material, which creates new research directions in materials science. Based on the DFT theory, this work studies the doping phosphorus atoms and in silicene nanoribbons in the presence of an external electric field of about 0.1V/Angstrom. The work also limited the doping study in two cases: The doping case of one phosphorus atom and the 100% doping configuration. There are two doping positions of

Lavita J. Martis, N. Parushuram, Y. Sangappa

Pages 1680-1683

Article preview 

Abstract

Abstract

In the present work, the preparation of nanocomposite films of poly(vinyl alcohol) (PVA) embedded with *in situ* generated gold nanoparticles (AuNPs) by UV-B irradiation is reported. The formation of AuNPs showed surface Plasmon resonance (SPR) peak in the wavelength range of 532–558nm, confirmed by UV–Visible (UV–Vis) spectroscopy. X-ray diffraction (XRD) analysis confirmed the crystalline nature of the AuNPs with FCC crystal structure. FT-IR analysis suggests the interaction between AuNPs and PVA through intra/intermolecular hydrogen bonding. Surface morphology was found by scanning electron microscopic (SEM) analysis. The as-prepared PVA/Au nanocomposite films showed enhanced electrical conductivity over pure PVA.

Research article Abstract only

Experimental investigation on triple concentric tube heat exchanger

Deepak Kumar Sharma, Nikimoni Das, Sanjay Kumar Singh, Krishna Murari Pandey

Pages 1684-1688

Article preview 

Abstract


Abstract

The main objective of this research paper is to evaluate the performance of triple concentric tube heat exchangers experimentally under steady-state conditions. Water is considered as the working fluid and is circulated through the inner tube, inner annulus, and outer annulus at different temperatures. For this purpose hot water, normal water, and intermediate temperature water are considered. The experiment has been performed in the laboratory of the Mechanical Engineering Department at BIT Sindri Dhanbad in India. The arrangement of a triple concentric tube is installed by using three tubes of different materials. Aluminium, Copper, and galvanized iron (G.I) are used to make an inner tube, inner annulus, and outer

Studies on usage of natural fibers and eco sand for sustainable concreting

K. Pavithra, Manisha Shewale, Shraddha Asalkar, Nitin Shinde, ... R. Anuradha

Pages 1689-1693

Article preview 

Abstract

Abstract

Modern construction materials need to have high strength and durability due to the loads that it may experience during its life cycle, also rigorous norms set by standardising agencies make it mandatory. Concrete is a brittle material that is having less tensile strength but its used in many tensile members including beams which demands some amount of tensile strength to be incorporated into it. Also demand for concrete production is steadily raising and its becoming numero uno due to its versatility, yet it needs modification to suit the need and demand. Incorporating fibers into the concrete is being practiced in field and also studied in research by bountiful researchers, in this work a combination of a natural fiber (Sisal) and a manmade fiber (polypropylene) is used in various compositions to increase the tensile strength and to reduce brittleness of concrete. Studies were conducted to identify the variation of strength with and

Research article ○ Abstract only

Structural and spectroscopic analysis of pure phase hexagonal wurtzite ZnO nanoparticles synthesized by sol-gel

Tufail Ahmad, Vidit Pandey, Md Saddam Husain, Adiba, Sandeep Munjal

Pages 1694-1697

Article preview 

Abstract

Abstract

In the present study, Sol-gel route was employed to synthesize the pure phase hexagonal wurtzite zinc oxide (ZnO) nanoparticles with crystallite size and lattice strain ~ 21 nm and $\sim 7.6 \times 10^{-4}$ respectively. The synthesized ZnO nanoparticles were characterized by X-ray Powder Diffraction (XRPD), Fourier Transform Infrared (FTIR) Spectroscopy and Raman spectroscopy at room temperature. FTIR spectrograph demonstrates the presence of

Arriving the suitability of polyethylene wastes in flexible pavements: An experimental approach

Meyyappan. PL, Keerthana. S, Jemimah Carmichael. M

Pages 1698-1701

Article preview 

Abstract

Abstract

The disposal of non-biodegradable materials like polyethylene, tetrapak etc have been a severe threat to the surrounding environment especially in developing/ under developing countries. Out of that, the polyethylene materials are commonly used to pack food and essential commodities like milk, curd, ghee, oil, snacks etc. After usage of these products, the polyethylene packs are left as solid wastes which was disposed either incineration or by dumping as landfills. An effort to find useful application of those polyethylene material wastes is on one side. In other side the existing pavements are not able to withstand the increase in traffic loads and thereby results to premature failure causing various pavement distress. In these aspects, to explore new suitable and sustainable alternative bituminous mix is a demanding need. In order to address both these issues, the present study investigated the suitability of polyethylene wastes in

Research article ○ Abstract only

X-ray structure of 4-aminopyridinium-oxalate-oxalic acid-hydrate (1/1/0.5/0.5) and its characterization

S Ilakkiaselvi, A Sinthiya

Pages 1702-1708

Article preview 

Abstract

Abstract

Single crystal of 4-Aminopyridinium-oxalate-oxalic acid-hydrate (1/1/0.5/0.5) ($C_5H_7N_2^+ \cdot C_2HO_4^- \cdot 0.5 C_2H_2O_4 \cdot 0.5 H_2O$) (4APOOAH) was synthesized and grown by slow evaporation solution growth technique. The grown was subjected to three dimensional X-ray crystallography which reveals that the crystal 4APOOAH crystallized in the triclinic crystal system (CCDC No.: 1949668) with the cell parameters ($a=3.7110(6)$ Å,

Research article Abstract only

Honey based hydrogel as delivery system for wound healing

Sneha Ann Abraham, G. Yashavanth, R. Deveswaran, S. Bharath, ... S. Shanmuganathan

Pages 1709-1718

Article preview 

Abstract

Abstract

The present study was intended for development of hydrogel-based drug delivery system with wound healing potential. The honey-based hydrogels were prepared by cold mechanical method. Carbopol-940 and Chitosan (75% deacetylated) were used as polymers. Triethanolamine was used as a pH adjuster. Methyl paraben was used as preservative and propylene glycol as an emollient. The developed hydrogels were characterized for pH, viscosity, swelling index, spreadability, drug content, *in-vitro* permeation studies using dialysis membrane and *in-vivo* wound healing activity by excision wound model. The results indicated the acceptability of the prepared hydrogels by the evaluation tests. The *in-vitro* permeation studies showed that release of honey varied according to the percentage of honey and the polymer used in the hydrogels. Formulation F14 was found to be the best formulation with cumulative percent drug release

Research article Abstract only

Effect of sawdust addition on the mechanical and water absorption properties of banana-sisal/epoxy natural fiber composites

Niharika Kumari, Manikant Paswan, K. Prasad

Pages 1719-1722

Article preview 

Abstract

Abstract

6/22/2021 11:56 and hardener LY953 in the 4:1 ratio according to ASTM standards. All the specimens were made with proper composition of 20 wt% of reinforcing materials and 80 wt% of the matrix material. The mechanical (tensile strength, compressive strength, flexural strength, and impact strength) properties and Brinell hardness of prepared specimens were conducted according to ASTM standards. The tensile, compressive,

Research article Abstract only

Structural analysis of surprisingly formed Cu^{II} cubane through the specific cleavage of >C=N— and >C—S— of a Schiff base ligand and its biological activities

R. Madaselvi, R. Sivakumar, M. Arun Pandian, S. Arunachalam

Pages 1723-1729

Article preview 

Abstract

Abstract

Extraordinary specific breaking of the carbon-sulfur linkage of the thiosemicarbazone moiety from a Schiff base has been watched the blue, bringing about the development of a four coordinated tetra Cu^{II} cubane containing triphenyl phosphine and μ_3 -S as ligands. At the same time, the ketimine group of the Schiff base ligands also got ruptured to regenerate the diketone used for the synthesis of thiosemicarbazone ligand. The synthesized complex was spectrally and structurally investigated. The crystallographic information reveals that the complex is having the shape of a cubane, where as the alternate four corners were occupied by tricoordinated copper and the other corners are by μ_3 -S respectively. μ_3 -S behaves as a ligand which is having the binegative site and neutral site to get bonded with the copper as bridging ligand. Antimicrobial and antioxidant efficacy were explored and shows a better results than the controls used

Research article Abstract only

Preparation and characterization of caprine bone derived mineral substituted hydroxyapatite/phyllanthus acidus extract for biomedical applications

P. Sadiqbasha, R. Sivakumar, M. Arunpandian, C. Ramalingan, ... S. Arunachalam

Pages 1730-1736

Abstract

Natural (Caprine bone) Hydroxyapatite/Phyllanthus acidus and Gallium substituted Hydroxyapatite/Phyllanthus acidus composite powders were successfully synthesized by thermal decomposition method. The synthesized powders were confirmed function group by FTIR and the phase purity, crystalline size through XRD results. The SEM results show that the size of the Hydroxyapatite powders reduced with the substitution of Gallium in the natural Hydroxyapatite composite which leads to the formation of finer powders and uniform surface morphology. Natural Gallium substituted Hydroxyapatite/Phyllanthus acidus composite were successfully achieved to obtained better morphology. Gallium substituted Hydroxyapatite/Phyllanthus acidus shows better antibacterial activity compare to Hydroxyapatite/Phyllanthus acidus composite

Research article Abstract only

An investigation on Fatigue Behaviour of Bi-Directional Fibre Reinforced Polymer Nano Composite using FEA solver

A.Padma Rao, Andaluri Satyanarayana

Pages 1737-1744

Article preview 

Abstract

Abstract

The world is looking for the new materials because of rapid industrialization, specific needs and demands from the people. Glass fiber reinforced polymer composites are the promising materials from few decades. Glass fibers reinforced polymer composites have been prepared by various manufacturing techniques and are widely used for various applications. Nowadays, it has been used in electronics, aviation and automobile application. Glass fibers are having excellent properties like high strength, flexibility, stiffness and resistance to chemical harm. Each type of glass fibers have unique properties and are used for various applications in the form of polymer nano-composites. Nano materials in polymer nano-composites (PNC) play major role in mechanical properties. PNC's are one of the novel materials, which give better functional properties than other materials. Fatigue failure in complex structures cannot be predicted earlier. Fatigue

Research article Abstract only

Article preview 

Abstract

Abstract

In this paper, we have designed a one-dimensional chalcogenide photonic crystal using As_2Se_3 /air multilayered structure. A single defect is introduced by replacing As_2Se_3 layer with As_2S_3 . In the proposed structure, the well-known transfer matrix method is employed to determine the transmission spectra for both TE (transverse Electric) and TM (transverse Magnetic) modes. A theoretical analysis of effect of incidence angle on defect modes is presented. Variation in incidence angle causes the shift in defect modes.

Research article Abstract only

Tribological analysis of Al-Si alloy based MMCs at elevated temperature

Gagan Bihari Moharana, Ajit Kumar Senapati

Pages 1749-1755


Article preview 

Abstract

Abstract

In the current study, investigates the tribological behaviour of aluminium-based metal matrix composites (MMCs) and aluminium-based hybrid metal matrix composites (HMMCs) fabricated through the stir casting process. Reinforcements like Al_2O_3 and SiC are vastly used to enhance the quality of metal facets and reduce the rate of wear. In this work, the matrix metal Al alloy (LM6) is reinforced with 10wt% of (Al_2O_3), 10wt% of (SiC) & (5%SiC+5% Al_2O_3) to manufacture MMCs & HMMCs respectively, and 1 wt% of Mg mainly used for wettability of composites. The whole tribological experiment carried out through a computerized pin-on-disc setup by varying the input parameters like elevated temperature (T) i.e. 50,100,150°C, sliding distance (D) i.e. 500, 1000, 1500m, and sliding velocity (V) i.e. 1,2,3 m/s with a constant load of 24.5N. The outcome response is considered as wear rate (WR) (mm^3/m) and coefficient of

Research article Abstract only

[Article preview](#) 

Abstract

Abstract

In the present work, effect injection timing (IT) on the modified dual fuel (DF) engine performance with effective utilization of biodiesel and gaseous fuel combinations is reported. Biodiesel prepared Ceiba Pentandra oil called Ceiba Pentandra oil methyl ester (CPNTOME) and its B20 blend (CPNTOME B20) are used as pilot injected fuels while the biogas (raw and purified) is used as the inducted fuel in the modified DF engine. Hence, the present research focus on the study of DF engine performance fuelled with liquid and gaseous fuel combinations. Meanwhile, the effect of IT on modified DF engine performance is investigated. Brake thermal efficiency (BTE), carbon monoxide (CO), hydrocarbon (HC) and smoke emissions were found to be less besides higher emissions of NO_x were observed. Combustion parameters such as ignition delay (ID) and peak pressure (PP) are analysed. The DF engine operated on renewable fuel combinations in DF

Research article  Abstract only

Synthesis and investigation of structural, morphological, thermal behaviour, and magnetic properties of CoFe₂O₄-MnO₂ nano-composites

Akash Kumar Sahu, Rudrarapu Aravind, Gouri Sankhar Brahma

Pages 1762-1768

[Article preview](#) 

Abstract

Abstract

In the present work, nano-composite of CoFe₂O₄-MnO₂ has been successfully synthesized by a simple wet chemical route in three steps. Samples were sintered at 800 °C for a period of 5 hrs to get the desired phases. X-ray diffraction studies have confirmed the existence of both CoFe₂O₄ and MnO₂ phases. The average crystallite size was found to be 59.8 nm. Fourier Transform Infrared Spectroscopy analyses confirmed the occurrence of both phases by showing a characteristic band of ferrites at octahedral and tetrahedral sites as well as the vibrational mode of Mn-O. Scanning Electron Microscope analysis was carried out to study the morphology of the sample, which revealed the rod-like appearance of the

Optimum utilization of ceramic tile waste for enhancing concrete properties

Rajat Kumar Goyal, Vinay Agarwal, Rajesh Gupta, Kusum Rathore, Prakash Somani

Pages 1769-1775

Article preview 

Abstract

Abstract

The use of ceramic products (tiles, electrical insulators, sanitary fitting, etc.) in building and structural construction is increasing day by day. Generation of ceramic waste is increased globally due to the fragile nature of ceramic it easily breaks during processing, transportation, and installation. Therefore, researchers are growing interest in using ceramic waste as alternative aggregate materials for construction. While other ceramic product wastes such as sanitary wares and electrical insulators have been extensively investigated, not many findings are available on ceramic wall and floor tiles wastes. Thus, the current study focuses on the mechanical (compression, tensile, flexural, and abrasion) and permeability characterization of waste ceramic wall and floor tiles aggregate concrete. Ceramic tiles were used as crushed coarse aggregate in concrete as a replacement for natural aggregates by the replacement level of 0% 5% 10% 15% 20% and 25%

Research article ○ Abstract only

Efficacy of photoluminescenes and magnetic behavior of Ce doped ZnO nanoparticles by solid state reaction method

B. Arunkumar, J. Vasudevan, S. Johnson Jeyakumar, M. Jothibas

Pages 1776-1781

Article preview 

Abstract

Abstract

The synthesis of Ce doped ZnO nanoparticles exhibits the enhancement of results and its favor to electronic properties. The minimum average crystal size was obtained from 8 wt% (8 nm). The weight percentage (wt%) of cerium doping concentration increases, average crystal sizes are decreased upto 8 wt% and then crystal size increased for 10 wt% of doping level. The UV-Visible spectra analysis shows that the high

Research article  Abstract only

Mechanochemical synthesis of CaTiO₃ powders: Microstructure and surface morphology

July Randhari, Suchsmita Senapati, Biren Samal, Prafulla K. Mallik

Pages 1782-1785

Article preview 

Abstract

Abstract

Calcium titanate (CT) is a material that is similar to hydroxyapatite in biological properties. In this report, CT powders was prepared by using high energy planetary ball mill and to determine their phases distribution, microstructure and surface morphology as an effect of milling duration was characterized by XRD, SEM, and BET analysis. As results, XRD, SEM and BET analysis indicate that all the peaks were the CaTiO₃ powders in regular shape and uniformly distributed size of 2 μm in 32 h. Finally, it can be concluded that with increasing the milling time has significantly influenced and reduced CaTiO₃ crystalline powders after calcinations.



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2021 Global Conference on
**RECENT ADVANCEMENTS IN SUSTAINABLE
MATERIALS (GC-RASM 2021)**

29 - 30, July 2021 | A.J. Institute of Engineering & Technology
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Dr. A J SHETTY

President

A.J. Institute of Engineering and Technology,
Mangaluru, Karnataka, India.

I am enraptured to note that A J Institute of Engineering & Technology in heading the Global Conference on Recent Advancements in Sustainable Materials (GC-RASM 2021) & Recent Development in Computer and Communication Technologies (GC-RDCT 2021) on 29th and 30th of July, 2021.

Conference will have research papers presented from different Academician Industrial Houses, Research Institutions situated across different part of the world such as Australia, Canada, Bangladesh, Malaysia, Ukraine, Russia etc.

It would provide platform to premier interdisciplinary for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the respective fields.

I convey my good wishers for successfully conducting of the conference and congratulate one and all for the successful effort put across for arranging the conference in AJIET Campus, Mangalore, India.





PRASHANT SHETTY

Vice President
A.J. Institute of Engineering and Technology,
Mangaluru, Karnataka, India.

It is my pleasure to learn that A J Institute of Engineering & Technology is organizing Global Conference on Recent Advancements in Sustainable Materials (GC-RASM 2021)& Recent Developments in Computer and Communication Technologies (GC-RDCT 2021) in our campus on 29-30 July, 2021.

GC-RASM 2021 will showcase the latest research and development in the key areas related to the Materials science and Engineering with GC-RDCT 2021 will showcase the recent developments in the broad fields of Computers and Communication Technologies. Such events are essential to inspire research students and faculty members and further improve the quality of education, provide continuous learning opportunities for professionals, and allow exchange of ideas and promote collaboration.

I applaud the initiative by the organising committee in taking up the responsibilities of organising the conference. I also congratulate the members of the Editorial Board and all participants who have contributed their role in submitting research papers to the proceedings.

I urge all the participants to make optimum use of the opportunity to learn what is new in your field and its broader areas emerging globally. My best wishes for a fruitfully successful event





Dr. SHANTARAMA RAI C.

Principal
A.J. Institute of Engineering and Technology,
Mangaluru, Karnataka, India.

It is my great pleasure to host the very first Global Conference on Recent Advancements in Sustainable Materials (GC-RASM 2021) and Global Conference on Recent Developments in Computer and Communication Technologies (GC-RDCT 2021) on 29th and 30th of July, 2021 at A J Institute of Engineering & Technology, Mangalore.

The conference offers an open forum for innovation in material science as well as materials designing controls along with the capacity of taking care of multi-disciplinary issues in various divisions of the economy. The presented papers of GC-RDCT 2021 will be published by IOP Material Science & Engineering (IOP-MSE) – Indexed in CPCI – web of science and GC-RASM 2021 by Material Today Proceeding (MTPR) - an Elsevier Journal.

On behalf of AJIET Fraternity, I extend a hearty welcome to all the delegates and participants from in and around the country to this conference. I assure that this conference will be highly beneficial to students, scholars, entrepreneurs, institutions, industry and the society as a whole. I am sure this conference will serve as an opportunity for delegates to gain quality input for on-going as well as future research.





Dr. SANGEETHA D.M.

Convenor, GC-RASM 2021
A.J. Institute of Engineering and Technology,
Mangaluru, Karnataka, India.

Materials science and engineering is one of the prominent sector creating a revolution in the modern era. The technological developments in the materials science paves the road for advancements in materials science and manufacturing technology across the world. The developments in the field of computer and communication technology upheaved the manufacturing sector by incorporating Intelligent Manufacturing System which is more advanced and precise. The innovation in material science and computer technologies has the capacity of taking care of multi-disciplinary issues in various divisions of the economy.

Around 600 research papers were received for the conference within India and around the world. All the papers were critically reviewed and around 274 were shortlisted for oral presentation with a 38% acceptance ratio. All the abstract of the technical papers are compiled to formulate this volume. The manuscripts covers almost all the areas of Engineering science and technology. All the technical papers will be published by Scopus Indexed Journal – Material Today Proceedings and IOP-Material Science and Engineering – CPCI Web of Science Indexed Journal. This platform provided a great opportunity for researchers from various universities and institutions to interact and exchange ideas future scientific endeavours.

I am grateful to all contributors who have presented their valuable work during this conference. I am also thankful to the editors of journals MTPR and IOP-MSE for accepting to publish the selected papers of conference.

I thank International advisory members, reviewer committee member's, editorial board members and technical committee member's for their constant support to make this conference a grand success.

I whole heartedly extend my deep concern and heartfelt thanks to the Management, Principal, Head of all departments, faculty members, staff members for their constant support and encouragement for successful completion of this conference.

I wish all the success for the two days international conference GC-RASM 2021 and GC-RDCT 2021 and its deliberation



1

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RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 1011	Polyaniline-CuO Nanocomposite: Electrical, Structural and Sensor Properties <i>M. Nagaraja*, Sushma Prashanth, Jayadev Pattar, H.M. Mahesh, and K. Rajann</i>	001
RASM 1045	Synthesis and Application of Benzodiazepine Compounds as Corrosion Inhibitor for Mild Steel in Acid Media <i>T.Sasikala, K.Gnana Priya and A.Akila</i>	001
RASM 1049	Structural Response of Self-Compacting Concrete Beams under Elevated Temperature <i>Mervin Ealijas Mathews, A. Diana Andrushia, Tattukolla Kiran, B. Siva Kumar Yadav, Balamurali Kanagaraj and Anand. N</i>	002
RASM 1050	Development and Strength Assessment of Sustainable High Strength Fiber Reinforced Concrete <i>Jayakumar. G,Mervin Ealijas Mathews, Tattukolla Kiran, B. Siva Kumar Yadav, Balamurali Kanagaraj and Anand. N</i>	003
RASM 1058	Vegetative Voltaic Cell from Ethanolic Leaf Extract from <i>Prosopis juliflora</i> Plant <i>Sinthiya A</i>	003
RASM 1061	X-ray Structure of 4-Aminopyridinium-Oxalate-Oxalic Acid-Hydrate (1/1/0.5/0.5) and Its Characterization <i>S. Ilakkiyaselvi and A. Sinthiya</i>	004
RASM 1071	Enhanced Concrete Performance in Cracking Resistance and Chloride Penetration using Hybrid Fiber Blends <i>Manjunath V. Bhogone and Kolluru V. L. Subramaniam</i>	004
RASM 1072	Optical and Upconversion properties of Bismuth Tellurite Glasses Co-doped with Er^{+3} - Yb^{+3} Ions <i>Ratnesh K. Sharma, S. K. Mahajan, Z. K. Ansari, and Ghizal F. Ansari*</i>	005
RASM 1086	An Investigation on the Performance and Viability of a Hybrid Twisted Blade Profile for a Horizontal Axis Micro Wind Turbine <i>Ratan U. Gaonkar and Ramakrishna N.Hegde</i>	005
RASM 1088	Preparation of UV, LASER and White Light Sensitive Conducting Polymer Poly (3, 4-ethylenedioxythiophene) "PEDOT" Nanoparticles <i>U. B. Mahatme*, R. D. Utane, A. H. Rangari and G. D. Tidke</i>	006
RASM 1090	Efficacy of Photoluminescences and Magnetic Behavior of Ce Doped ZnO Nanoparticles by Solid State Reaction Method <i>J.Vasudevan, B.Arunkumar*, S.Johnson Jeyakumar and M.Jothibas</i>	007
RASM 1091	Effect of Oxidants and Dopant on Morphology, Crystallinity and Optical Absorbance of Nano Structural Polyindole <i>RajuUtane*, U. B.Mahatme, G. D.Tidke and Aparna Rangari</i>	008
RASM 1092	Advance Recovery Approach for Efficient Recovery of Waste Lubricating Oil by Different Material Formulations <i>Sayantan Sarkar, Deepshika Datta, K S Deepak and Bimal Das</i>	009

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 1093	Structural, Morphological and Optical Studies of CdSe Quantum Films Synthesized by Ultrasonic Vibration Assisted Drop-Casting Method <i>Megha Sachdeva</i>	009
RASM 1098	Third Order Measurements, Thermal and Mechanical Stress Tolerance Studies of a Nonlinear Borate Family Hybrid Crystal towards Optoelectronic Applications <i>M. Divya, G.B. Anushya, A. Joseph Arul Pragasam, G. Vinitha and P. Malliga*</i>	010
RASM 2004	The Use of Entropy-Based GRA Approach to Analyze and Optimize the Wire Electrical Discharge Machining Process for Nitronic-30 <i>Nilesh T.Mohite, Geetanjali V. Patil and Anupama N. Kallol</i>	011
RASM 2007	Thermal and Optoelectrical Properties of Cobalt Doped and Undoped Strontium L(+) Tartrate Pentahydrate Single Crystals <i>K.B. Reema and N.Jagannatha*</i>	012
RASM 2011	Multiobjective Optimization of Thermophysical properties of Indonesian Fly-ash Nanofluid <i>Khuram Maqsood</i>	013
RASM 2019	Impact of Mach number on the Flow Pattern in Suddenly Expanded Duct <i>Sher Afghan Khan, Zakir Ilahi Chaudhary, Maughal Ahmed Ali Baig, Ridwan, Hamza Afser Delvi and Mohammed Faheem</i>	014
RASM 2031	Migration Induced Localization of Multiwalled Carbon Nanotubes in PP Phase of PP/ABS blend and their Hybrid Composites: Influence on Mechanical and Thermal Properties <i>Ganesh Lohar, Pankaj Tambe, and Bhagwan Jogi</i>	015
RASM 2032	Synthesis and Characterization of Acid Treated Reduced Graphene Oxide <i>Pankaj Tambe</i>	016
RASM 2035	Profound probing of Groundnut Shell Ash (GSA) as Pozzolanic Material in Making Innovative Sustainable Construction Material <i>P. V. Premalatha*, S.SenthilKumar, C.S.Murali and K.VetriAadithiya</i>	016
RASM 2044	Chromium Oxide Regulated Nanoparticles Biosynthesis in Manihot Esculenta Leaf Extract <i>Thara*, Ignatius Navis Karthika, C. Ramesh and M.S. Dheenadayalan</i>	017
RASM 2051	The Effect of Cutting Fluid in Improving the Machinability of Inconel 718 using Ceramic AS20 Tool <i>Ivan Sunit Rout, P Pal Pandian, Anil Raj and Anil Melwyn Rego</i>	017
RASM 2053	Experimental Evaluation of Sorptivity for High Strength Concrete Reinforced with Zirconia Rich Glass Fiber and Basalt Fiber <i>Ajmal Paktiawal and Mehtab Alam</i>	018
RASM 2059	Study of Radiation Shielding Materials on Microstrip Patch Antenna for Sustainability <i>John Colaco and Rajesh B. Lohani</i>	019

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 2068	Configuration of Phosphorus Doping in Silicenenanoribbons in the Presence of an External Electric Field <i>Hoang Van Ngoc</i>	019
RASM 2069	Ion Transport Property Studies of a New TiO ₂ Dispersed Na ⁺ Ion Conducting Nanocomposite Polymer Electrolytes <i>Richa Sharma, Arti Verma, Angesh Chandra, Archana Chandra*</i>	020
RASM 2074	Enhancement on the Properties of Recycled Coarse Aggregate through Bio-deposition – An Experimental Study <i>S. Jagan, T. R. Neelakantan and M. Padma Lakshmi</i>	020
RASM 2091	Structural Characterization and Investigation of Magneto-Optic and Multiferroic Properties of Nanostructured CoFe ₂ O ₄ Prepared by Sol-Gel Derived Facile Chemical Route <i>Shashank Bhushan Das, Vivek Kumar, Md. Muzzammilul Haque Siddiqui, Nishant Kumar, Rakesh Kumar Singh* and Rajneesh Kumar</i>	021
RASM 3003	Design of an Impact Attenuator for Passive Safety on Roads <i>Christian I. Montaleza*, Jimmy W. Gallegos*, Marco E. Amaya, and Oscar Arteaga</i>	022
RASM 3008	Honey Based Hydrogel as Delivery System for Wound Healing <i>Sneha Ann Abraham, Yashawanth G, R. Deveswaran*, S. Bharath, Mohammad Azamathulla and S. Shanmuganathan</i>	022
RASM 3021	Analysis of Hybrid Tandem Solar Cell using Neural Network <i>Meshak Nath Ghoshal and Vilas H Gaidhane</i>	023
RASM 3038	Durability of Fly Ash and Silica Fume based Composite Fiber Reinforced High-Performance Concrete Subjected to Acid attack <i>Sachin Patil, H M. Somasekharaiah, H Sudarsana Rao and Vaishali G Ghorpade</i>	023
RASM 3040	DSSC Using <i>Wrightiatinctoria</i> (Roxb.) R Br.: A TRIAL <i>U Malavika Lakshmi, Aruna Raj, Jishad A Salam, R Jayakrishnan*, Priji S, A Gangaprasad, K G Gopachandran and Biju V</i>	024
RASM 3041	Effect of Particle Damper Technique on Tribological Properties during Hard Turning Process <i>Lawrance. G*, Sam Paul. P, Joshwa D, Sharvilin. S, Sudarsan K, and Arun R</i>	024
RASM 3053	Design of Multipurpose Mechanical Machine <i>Ajay Bonde, N.K. Mandavgade and S.R. Jachak</i>	025
RASM 3055	Effect of Welding Conditions and Flux Compositions on the Metallurgy of Welded Duplex Stainless Steel <i>I.M.B. Omiogbemi*, S. Pandey, D. S. Yawas, M.O. Afolayan and E.T. Dauda</i>	026
RASM 3076	Force Transmissibility of the Viscoelastic Material Used as Vibration Isolation in Power Loom <i>Prahalad S Badkar and M.M Benal</i>	027

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 4001	Tribological Analysis of Al-Si alloy based MMCs at Elevated Temperature <i>Gagan Bihari Moharana* and Ajit Kumar Senapati</i>	027
RASM 4003	Comparative Study of Confining Reinforcement Used for the Rectangular Concrete Short Column <i>A.P.Khatri and G. A. Hinge</i>	028
RASM 4005	The Combined Effect of GGBS and Low Volume Fibres on the Low-Velocity Impact and Mechanical Properties of Self-Compacting Concrete <i>Srishaila Jagalur Mahalingasharma, Prakash Parasivamurthy, Vivek Ram Das and Arun.B.R</i>	028
RASM 4016	Development of an Ammonia Gas Sensor Employing an Inter-Digital Capacitive Structure Coated With $Mn_{0.5}Zn_{0.5}Fe_2O_4$ Nano-Composite <i>Jiss Paul* and Jacob Philip³</i>	029
RASM 4024	Flexural Shear Behavior of FRHSC Beams with Fibers only in Shear Span <i>Parvathy Jayakumar and Dhanya Sathyan</i>	029
RASM 4033	A Simplified Bibliometric Mapping and Analysis about Sustainable Polymers <i>Fabiula Danielli Bastos de Sousa</i>	030
RASM 4036	Experimental Investigation on Compression Strength of EPOXY/PVC Blend with Different Fibre Glass Reinforcements Using Taguchi's L_{27} Orthogonal Array <i>Mohammed Raffic. N*, Ganesh Babu, Rajasekaran Saminathan, Afaf M.Babeer, H.Hadidi and Akshay Y P</i>	030
RASM 4040	Steady-State and Transient Raman Gain Coefficients of Weakly-Polar Magnetoactive Doped Semiconductors <i>Jaivir Singh, Sunita Dahiya and Manjeet Singh</i>	031
RASM 4042	Mechanochemical Synthesis of $CaTiO_3$ Powders: Microstructure and Surface Morphology <i>July Randhari, Suchsmitta Senapati, Biren Samal and Prafulla K.Mallik</i>	031
RASM 4043	Experimental Investigation on Triple Concentric Tube Heat Exchanger <i>Deepak Kumar Sharma, Sanjay Kumar Singh, and Krishna Murari Pandey</i>	032
RASM 1009	A study on the photo stability of Basella Rubra (Pasalai fruit) Extract with Nano Flower Zinc Oxide. <i>Muthulingam S, Greeshma KP, Poornima K and Sam John</i>	032
RASM 1031	Structural Analysis of Surprisingly Formed Cu^{II} Cubane through the Specific Cleavage of $>C=N-$ and $>C-S-$ of a Schiff Base Ligand and its Biological Activities <i>R. Madaselvi, R. Sivakumar, M. Arun Pandian and S. Arunachalam</i>	033
RASM 1032	Numerical Simulation of Effect of Geometry, Material on Thermal Performance of Engine Cylinder Fins <i>Chandrakant R Sonawane, Pratyush Rath, Nishant Vats, Shreyas Patekar, Prakhar Verma and Anand Pandey</i>	034

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RASM 1036	Conducting Polyaniline Doped with Zinc Tungstate Matrix Film as Gas Sensing Composite <i>Machappa.T., Badrunnisa.S. and M V N Ambika Prasad</i>	034
RASM 1043	An Analytical Study on Electroosmotic Flow Within a Microchannel Disregarding the Debye–Huckel Approximation <i>Sudip Simlandi and Avisankha Dutta</i>	035
RASM 1044	Generation of Square Micropattern using Electrochemical Micromachining <i>S. Kunar, R. Kumar and M.S. Reddy</i>	036
RASM 1047	Numerical Simulation of Savonius Rotors used for Low Wind Speed Application <i>Chandrakant R Sonawane, Yogini Sasar, Moiz Shaikh, Yash Kokande, Mohammad Mustafa and Anand Pandey</i>	037
RASM 1055	Synthesis of Marigold-like ZnIn ₂ S ₄ Microspheres at Low-Temperature <i>Mool Chand, A. S. Rawat, Manika Khanuja and Mitesh Ranwa</i>	037
RASM 1063	Investigation of Dielectric Properties and Ferroelectric Phase Transition in Lead-Free AgNbO ₃ <i>Aditya Joshi and Subhash C.Bhatt</i>	038
RASM 1076	Excess Thermodynamic Properties of Binary Liquid Mixture at Different Temperature <i>J. Jeya Priya, C. Duraivathi, J. Poongodi, K.Amudhavalli and H.Johnson Jeyakumar</i>	038
RASM 1067	Studies on Computing Compressive Strength of Zeolite Blended Concrete Using Multiple regression Analysis <i>Sushant Waghmare, Amey Katdare, and Nandkumar Patil</i>	039
RASM 1082	Ultrasonic Study of Molecular Interactions in Organic Liquid with CCl ₄ at Different Temperature <i>C.Duraivathi, J.Jeya Priya and J. Poongodi</i>	040
RASM 2001	Experimental Investigations on the Beta Attenuation Properties of Lead Monoxide – Polycarbonate Composite Films <i>Vijayashri Ashok Kandagal, Rajeshwari Mirji and Blaise Lobo</i>	040
RASM 2008	Magnetic Susceptibility and Frequency Dependence AC Conductivity of PPY/PANI/V ₂ O ₅ Nanosheets <i>Tidke G. D., Mahatme U. B., Bhange A. C. and Utane Raju</i>	041
RASM 2015	Spectroscopic Studies of Transition Metal Ion-Doped Borate Glasses for Optical Applications <i>S. Hemalatha, M. Nagaraja, Madhu.A, K. Suresh and Srinatha N</i>	042
RASM 2016	Buckling of Functionally Graded Carbon Nanotube Reinforced Composite Cylindrical Shell Panel with a Cutout under Uniaxial Compression <i>A.Balakrishna Reddy and K.S.Sai Ram</i>	042
RASM 2023	Stability Issues and Mitigating Techniques in the AC Grid System <i>Prawin Michael Angel and N.Palanisamy</i>	043

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 2028	Robustness Evaluation of sub-22nm FinFETs Electrical Characteristics Affected by Physical Variability <i>Kalasapati Bindu Madhavi and Suman Lata Tripathi</i>	043
RASM 2025	Enhanced Properties of Zn ²⁺ Substituted Cr ₂ O ₃ Nanoparticles in Escalating the Distillate Yield of Acrylic Pyramid Solar Still <i>K. Mohanapandian, P. Periasamy, K.Senthilkannan, K. Amudha, V. Shanmugapriya and B.Selvakumar</i>	044
RASM 2036	Synthesis and Investigation of Structural, Morphological, Thermal Behaviour, and Magnetic Properties of CoFe ₂ O ₄ -MnO ₂ Nano-Composite <i>Akash Kumar Sahu*, Rudrarapu Aravind and Gouri Sankhar Brahma</i>	045
RASM 2043	Effect of Different Electrode Angle as Well as Weld Direction on the Bead Geometry of Submerge Arc Welding Process <i>Rahul Kanti Nath*, Pabitra Maji, Atosh Kumar Sinha, Ranit Karmakar and Pritam Paul</i>	045
RASM 2066	Synthesis and Characterization of Manganese Doping on NiO Nanoparticles and its Supercapacitor Applications <i>S. Sivakumar and Nazir Ahmad Mala</i>	046
RASM 2077	Emission Control Exploring the Energy and Exergy Analysis for Turbines of a 500MW Coal-Based Conventional Power Plant <i>Malay Kanti Naskar, Nilkanta Barman and Sudip Simlandi</i>	046
RASM 2080	RF-sputtered V ₂ O ₅ Thin Films on Two Different Glass Substrates <i>S.TipawanKhlayboonme and Warawoot Thowladda</i>	047
RASM 2086	Hydroelastic Analysis of Floating Long Viscoelastic Plate in Shallow Water <i>Santanu Koley, Kshma Trivedi and Vipin V</i>	047
RASM 2088	Investigation of DFT on the Structural and Electronic Properties of Silicene Nanoribbons when Adsorption of Li, H, Fe <i>Vo Van On*, Nguyen Thanh Hung, Dang Thi Khanh Huyen, Le Thi Phuong Trinh and Le Vo Phuong Thuan</i>	048
RASM 2095	Effect of Sawdust Addition on the Mechanical and Water Absorption Properties of Banana-Sisal/Epoxy Natural Fiber Composites <i>Niharika Kumari, M. K. Paswan and K.Prasad</i>	048
RASM 2093	Effect of Water Pressure and Temperature on Spherical Float of Level Sensing Auto Drain Valve <i>S Sundararaj, P Krishnakumar, V R Anirudh, L Chetan Shikhar, G Surendhar and V Vijay</i>	049
RASM 3015	CFD Study on the Effect of Nanofluids in Natural Circulation Loop with a Side Heater <i>G.Narendar and Cherishma</i>	050

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 3016	Optimum Utilization of Ceramic Tile Waste for Enhancing Concrete Properties <i>Rajat Kumar Goyal*, Vinay Agarwal, Rajaesh Gupta, Kusum Rathore, and Prakash Somani</i>	050
RASM 3024	UV-Vis Absorption Spectroscopic Analysis of Er^{3+} ion doped Oxyhalide Glasses <i>G. Chandrashekaraiyah, K. J. Mallikarjunaiah, V. C. Veeranna Gowda, and C. Narayana Reddy</i>	051
RASM 3026	Multiple Slips and Heat Source Effects on MHD Stagnation Point Flow of Casson Fluid Over a Stretching Sheet in the Presence of Chemical Reaction <i>R. Mohana Ramana, K. Venkateswara Raju and J. Girish Kumar</i>	052
RASM 3029	Combined Effect of Metakaolin and Hybrid Fibers on the Strength Properties of High Performance Concrete <i>Adanagouda*, H M Somasekharaiah, M S Shobha and H M Mallikarjuna</i>	053
RASM 3037	Characteristics of MHD Casson Fluid past an Inclined Vertical Porous Plate <i>Ramachandra Reddy Vaddemani, Kodi Raghunath and Mopuri obulesu</i>	054
RASM 3043	Free Vibrations of Rigidly Fixed Electro-Magneto Non-Local Generalized Thermoelastic Cylinder with Voids Material <i>Sita Ram Sharma, Jai Chand Mehalwal and Dinesh Kumar Sharma</i>	054
RASM 3046	Bending Response Optimization of an Ionic Polymer-Metal Composite Actuator Using Orthogonal Array Method <i>Dillip Kumar Biswal, Bikash Ranjan Moharana and Tara Prasad Mohapatra</i>	055
RASM 3047	Thiourea doped TiO_2 : Structural, Optical and Electrochemical Properties <i>Kumavat Soni, Arzoo Sheikh and N. Lakshmi</i>	055
RASM 3051	Angular Dependence of Localized Mode of Chalcogenide Photonic Crystal <i>Rajpal Singh and A. Bhargava</i>	056
RASM 3061	Experimental Investigations of Wire Lag Phenomena on Wire Electrical Discharge Machining of M2 Tool Steel <i>Mukandar Sekh, Ziyauddin Seikh, Souren Mitra, Soumya Sarkar and Bijoy Bhattacharyya</i>	056
RASM 3068	Influence of Cu^{2+} Substitution on Structural and Optical Properties of Mg-Zn Ferrite Nanoparticles <i>Sangita N. Pund, Pratik A. Nagwade, Arvind V. Nagawade and Arun V. Bagade</i>	057
RASM 3069	Effect of CNT Content on Microstructure and Hardness of AlSi/MWCNT Nano Composite <i>Azeempasha and B.M. Rajaprakash</i>	057
RASM 3095	Mathematical Modeling of Various Forces Acting on Piston Rod Packing Rings <i>Rahul Nile, Utsav Verma, Abhijeet Deshpande, Sumit Joshi, Jay Shah and Atul Kulakarni</i>	058
RASM 3096	Investigation of Structural and Electrical Properties of Nickel Chloride Doped Pyrrole Aniline Copolymer <i>H. V. Ganvir, V. Y. Ganvir and R. S. Gedam</i>	058

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 4004	Synthesis Characterization DC Conductivity and EMI Shielding Studies of Iron-Decorated Polypyrrole-Fly Ash Nanocomposites <i>Basavaraja Patel B M, Revanasiddappa M, Rangaswamy D R, Manjunatha S and Ravikiran Y T</i>	059
RASM 4006	Arriving the Suitability of Polyethylene Wastes in Flexible Pavements: An Experimental Approach <i>Meyyappan PL, Keerthana S and Jemimah Carmichael M</i>	059
RASM 4014	Study of Structural and Electrochemical Properties of Ilmenite (FeTiO ₃) doped TiO ₂ <i>Arzoo Sheikh, Kumavat Soni and N. Lakshmi</i>	060
RASM 4018	Low Temperature Synthesis and Influence of Ce ³⁺ Substitution on Structural and Magnetic Properties of Nanocrystalline Cobalt Ferrite Using Citrate Precursor Sol-Gel Method <i>Gaurav Kumar, Rakesh Kumar Singh, Singh Sonu Kumar, Aniket Manash, Anjalee Prabha, Uday Shankar, and Om Priya</i>	060
RASM 4025	Parametric Amplification of Acoustical Phonons in Semiconductor Magneto-Plasmas: Quantum Effects <i>Devender Singh, B.S. Sharma and Manjeet Singh</i>	061
RASM 4046	Numerical Study of Fluid Flow and Heat Transfer for Flow of Cu-Al ₂ O ₃ -Water Hybrid Nanofluid in a Microchannel Heat Sink <i>V. Murali Krishna, M. Sandeep Kumar, R. Muthalagu, P. Senthil Kumar and R. Mounika</i>	062
RASM 4082	In Vitro Study of Green Synthesized ZnO Nanoparticles on Human Lung Cancer Cell Lines <i>Nutan Rani, Kavita Rawat, Anju Srivastava, Ektac, Sapna Yadav and Kalpna Guptad Kalawati Saini</i>	063
RASM 1002	Recycling and Reclamation of MSW Using MRF Techniques in Madurai <i>Premkumar R and S.Rajesh</i>	064
RASM 1075	Exploring Potential of Glass Surface Immobilized Short Antimicrobial Peptide (AMP) as Antibacterial Coatings <i>Sasmita Majhi and Abhijit Mishra</i>	064
RASM 1094	AHSS Welding using undermatching Filler Wires and Process Advantages with P-GMAW <i>Merbin John, Ashok Kumar P and Udaya Bhat K</i>	065
RASM 1097	A Simple Method for the Synthesis of Anatase-Rutile Mixed Phase TiO ₂ using a Convenient Precursor and Higher Visible-Light Photocatalytic Activity of Co Doped TiO ₂ <i>Ambily Jacob K, Moly Peter P, Elsa Jose P, Jeena Balakrishnan C and Joy Thomas V</i>	065
RASM 2024	Designing a Short, Potent, Pore-Forming Antimicrobial Peptide <i>Ankita Arora, Sasmita Majhi and Abhijit Mishra</i>	066

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 2029	Imidazole added Sulphamic Acid Single Crystals with Optimal Properties for Optoelectric Devices <i>S. Anciya, A.S.I. Joy Sinthiya, P. Selvarajan and R. Sreedevi</i>	066
RASM 2026	Effect of Temperature on Yield and Nanostructure of Multiple Layers of Carbon Nanotubes <i>S. Kalaiselvan, S. Prasad, R. Padmavathi and C. Ramesh</i>	067
RASM 2034	Structural and Spectroscopic Analysis of Pure Phase Hexagonal Wurtzite ZnO Nanoparticles Synthesized by Sol-Gel <i>Tufail Ahmad, Vidit Pandey, Md Saddam Husaina, Adiba and Sandeep Munjal</i>	068
RASM 2042	Effect on Lotus leaf for Dielectric Applications <i>M.Sivabharathy, N. Lenin, R. Rajesh Kanna M.Sheckdawood and A.Senthilkumar</i>	068
RASM 2054	Design of A 6 DOF Robot Manipulator for 3D Printed Construction <i>Md. Hazrat Ali, YernarKuralbay, AidosAitmaganbet and M.A.S.Kamal</i>	069
RASM 2056	Lateral Torsional Buckling of Steel Beams Strengthened by Steel Plate <i>M. Ranjithkumar, B.T. Usha priya and A. Punitha kumar</i>	069
RASM 2061	Effect of Filler Wire Strength on High Strength Low Alloy Steels <i>Merbin John, Ashok Kumar P, and Udaya Bhat K</i>	070
RASM 2067	Valorization of Soda Lime Glass in Cement Sand Matrix <i>Jagriti Gupta A. S. Jethoo and P.V. Ramana</i>	070
RASM 2081	Modelling of AOP Removal of B - Blocker Atenolol from Wastewater <i>N Vishnuteja Amruth, P Chinnaiyan, N Krishna Sridhar, Rajan Babu Akshaya and Prasitha</i>	071
RASM 2083	Experimental Study on Near-Dry Wire-Cut Electrical Discharge Machining of Inconel 718 alloy <i>Boopathi Sampath, Anton Savio Lewise K, Ram Subbiah and Sivaraman</i>	071
RASM 2084	Prediction of Mechanical Properties for Polyetheretherketone Composite Reinforced with Graphene and Titanium Powder Using Artificial Neural Network <i>Mohamed Zakaulla, Younus pasha and Shylesh kesarmadu Siddalingappa</i>	072
RASM 2087	Nanostructure Wrinkle Thin Films on Flexible Substrate: Tunable Optical Properties <i>Md Shahbaz Alam, Mohibul Kha and SK Faruque Ahmed</i>	072
RASM 3014	Investigation on Solid State Pyrolytic Decomposition of Bimetallic Fumarate and Tartrate Precursors of Co (II), Ni (II) and Zn (II) with Manganese <i>D. V. Nighot, M. B. Khanvilkar, N. J. Karale, R. A. Pawar, G. S. Gugale, S. S. Arbuji and A. K. Nikumbh</i>	073
RASM 3022	A Critical Study and Analysis of Process Parameters of Selective Laser Sintering Rapid Prototyping <i>S. I. A. Qadri</i>	074

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 3049	Carbon Dioxide and GHG Emission Reduction by Utilization of Groundnut Husk Ash in Concrete <i>Sunita Kumari and Rinku Walia</i>	075
RASM 3052	Theoretical Study on Various Contributions to the Magnetization of $Pb_{1-x}Eu_xSe$ <i>Giti Das, B. N. Parida and R. L. Hota</i>	075
RASM 3056	Recycled Substance Evaluation and Effect on Fire Resistance Structures <i>Arigela Surendranath and P.V. Ramana</i>	076
RASM 3071	Evaluation of Solvent Transport and Cure Characteristics of Chlorobutyl Rubber Graphene Oxide Nanocomposites <i>H Sreehari, Asok Aparna, Jitha S Jayan, A.S Sethulekshmi, Gopika Venu, Anjali K.P, Parvathy N, and Appukuttan Saritha</i>	076
RASM 3089	Evaluate the Optimum dosage of Nano Material on Self Sensing Properties for Nano Cement Composites <i>A.K. Roopa and A. M. Hunashyal</i>	077
RASM 4002	Synthesis, Single Crystal X Ray Diffraction Analysis and Thermogravimetric Studies of a Novel Cu (II) Based Metal Organic Frame Work from Isophthalate and Pyridine Linkers <i>Divya Mohan R, Arathi Anil, Athira Gopakumar, Saranya P, Anjaly P R, Anusha .S. Das, Anupriya Sukumaran, Anjitha J R, Rajeswari M, Gopika K Sureshkumar and Saranyaparvathi S</i>	077
RASM 4019	Evaluation of Normalized Thickness Variation of Superplastic Cone Forming <i>AnjaiahMudarapu, JalumediBabu and M. Venkata Ramana</i>	078
RASM 4021	Peroral Delivery of Risedronate Sodium for Treatment of Osteoporosis <i>Mukul K Khandelwal, Kabita Kumari, Bharath Srinivasan, AnbuJayaraman and Deveswaran Rajamanickam</i>	079
RASM 4049	Optimization of Cutting Forces and Tool-Tip Temperature in Turning of Nickel-Based Superalloy using FE Simulation <i>Jangali Satish G., V. N. Gaitonde, Vinayak N Kulkarni and Madhusudhana H K</i>	079
RASM 4051	Acoustic Emission Test Method for Investigation of M250 Maraging Steel Pressure Vessels for Aerospace Applications <i>Gowrishankar Wuriti, Somnath Chattopadhyaya and Tessy Thomas</i>	080
RASM 4053	Analysis and Optimization of Nozzle Distance during Turning of EN-31 Steel Using Minimum Quantity Lubrication <i>Ajay Kumar, Gurpreet Singh and Vivek Aggarwal</i>	081
RASM 4060	Novel Graphene-Based OPFET for Optoelectronic Applications <i>Jaya V. Gaitonde and Rajesh B. Lohani</i>	081
RASM 4086	Effect of PCB as Partial Replacement of Fine Aggregate and Coarse Aggregate in Concrete <i>SKM. Pothinathan, S. Pream Kumar, N Arunachelam and S. Christopher Gnanaraj</i>	082

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 4088	Finite Element Analysis of Polymeric and Cementitious Materials to Secure Cracks in Concrete <i>Rahul Goushis and Mini K M</i>	082
RASM 4090	Numerically Approach for Enhanced Mass Transfer of Bio-Convection on Magneto-Hydrodynamic Carreau Fluid Flow through a Nonlinear Stretching Surface <i>Golla Narsimulu, D Gopal and Rama Udaikumar</i>	083
RASM 4091	Elastic and Mechanical Properties of Titanium Diboride under High Pressure <i>Tanveer Ahmad Wani, Tara Prasad, Ado Ma'aruf, Anas Shitu and Ravi Shanker Ahuja</i>	083
RASM 5002	Evaluation of Strength Parameters of Ultra-Fine Flyash and Nanosilica Incorporated High-Performance Concrete <i>Pushpalatha R Gadag, Somasekharaiah H M, Vaishali G.Ghorpade and Sudarsana Rao H</i>	084
RASM 5007	Assessment of Asphalt Binder and Mixes Modified with Zycotherm and Sulphur <i>Maninder Singh, Kunal Jain, S.K.Singh, and Sukhjinder Singh</i>	084
RASM 5009	Effects of Crack Location and Depths of an Iron Bar: A Finite Element Approach <i>Rajib Karmaker and Ujjwal Kumar Deb</i>	085
RASM 5012	Evaluation of Cerium Oxide Nanoparticle as Corrosion Inhibitor for Mild Steel <i>Diksha Dileep Thiruvoth and Ananthkumar M</i>	085
RASM 5025	Analysis of the Thermoluminescence Glow Curve of CaSO ₄ :Dy Phosphor by Simplified General One Trap Differential Equation <i>N. Shitaljit Singh, H. Nungshibabu Singh, L. Lovedy Singh, and S. Nabadwip Singh</i>	086
RASM 5027	Influence of Glass Powder and Hydrated Lime on Strength Properties of Concrete <i>Nittin Sharma and Khushpreet Singh</i>	086
RASM 5075	Fly-Ash Conjoined Ground Granulated Blast Furnace Slag Proxy for Fresh and Hardened Responses <i>Anamika Agnihotri and P.V. Ramana</i>	087
RASM 5083	Anti Bacterial and Anticancer Activities of Quinoxaline-2-Carbohydrazide-N-Oxide Compounds <i>Swarupa Ketha, Shashikala Kethireddy, Sudhakar Chithaluri and Laxminarayana Eppakayala</i>	087
RASM 5086	Effect of Wave Shift of Porous Slab on Thermo-Hydraulic Transport Characteristics of Laminar Flow through a Wavy Channel <i>Prince Kumar and K.M. Pandey</i>	088
RASM 5089	Design Optimization of Strain Gauge Mounting Cross Section Length of Strain Gauge Balance Component for Wind Tunnel Application <i>I. Hanapur, S.S. Hiremath, N.R. Banapurmath, V.S. Yaliwal and P.A. Harari</i>	089

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 1016	Biological Material in Self-Healing of Concrete <i>Santosh A Kadapure and Umesh B Deshannavar</i>	089
RASM 1048	Theoretical investigation of ferroelectric Phase transition, and Tangent delta in CsH ₂ AsO ₄ (CDA) crystal <i>Kuldeep Kumar* and Trilok Chandra Upadhyay</i>	090
RASM 2030	An Investigation on Fatigue Behaviour of Bi-Directional Fibre Reinforced Polymer Nano Composite Using FEA Solver <i>A.Padma Rao and Andaluri Satyanarayana</i>	090
RASM 2048	Structural and Morphological Properties of Bismuth Telluride Nanoparticles Synthesized by Two-Step Hydrothermal Method <i>N S Abishek* and K Gopalakrishna Naik</i>	091
RASM 2058	Melting Phenomena of Cu _{0.25} Ni _{0.75} Bimetallic alloy: A Molecular Dynamics Approach <i>M. P. Samantaraya and S. S. Sarangia</i>	091
RASM 2073	Significance of Dynamic Control on Suddenly Expanded Flow when Nozzles are over, under, and Perfectly Expanded <i>Sher Afghan Khan, Maughal Ahmed Ali Baig, Ridwan, Mohammed Faheem, SuheelJ.I, and Hamza Afser Delvi</i>	092
RASM 2075	Factors Influencing Mobility in ITO Thin Films and the Consequent Effects on Optical and NIR Surface Plasmon Resonance Properties <i>Sharika E, Anjitha M, Arya K, Niveditha Nair, Sai Kiran, Vanagith V, Varsha. T. Babu and Sanjay K. Ram</i>	093
RASM 4010	Temperature Stresses in Functionally Graded (FGM) Material Plates using Deformation Theory – Analytical Approach <i>Sangeetha DM, Naveenkumar DT, Vinaykumar V, and Prakash KE</i>	093
RASM 4012	Stabilization of Cr ⁺⁶ in Sodium Dichromate Plant Residue through Down Draft Sintering (DDS) Technique and its Application in Manufacture of Building Bricks <i>Surabhi Dipali Muduli and Bansidhar Nayak</i>	094
RASM 4023	Development of Green Geo-Adsorbent Pellets from Low Fire Clay for Possible Use in Methylene Blue Removal in Aquaculture <i>Priyanka Sharma, Aramide Fatai Olufemi and Kushal Qanungo</i>	094
RASM 4069	Investigating the Performance of Self-Compacting Concrete Pavement Containing GGBS <i>Chiranjeevi Tadi and T.Chandrasekhar Rao</i>	095
RASM 4071	Dielectric Properties of Steel Melting Shop (SMS) Slag <i>Diptiranjana Barala, Rahul Mohanta, BhaghyashreeSahoo, Renuprava Dalai and Prafulla K.Mallik</i>	095
RASM 4075	Trajectory Features and Energy Dissipation of Conventional and Modified (Deflector) Ski-Jump Bucket <i>Vivek Chavhan and Ganesh Hinge</i>	096

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 4080	Comparative Analysis of Drop Impact Resistance for Different Polymer Based Materials Used for Hearing Aid Casing <i>Aishwarya Gosavi, Atul Kulkarni, Yogiraj Dama and Abhijeet Deshpande</i>	097
RASM 4083	Preparation, Characterization of SF- HPMC Blend Films and SF Microparticles <i>G.Rajasha Shetty and B. Lakshmeesha Rao</i>	098
RASM 4093	Stabilization of Soil Nailed Slope by Flexible Materials <i>Mohammad Farhad Ayazi and Amanpreet Tangri</i>	099
RASM 4095	Modelling the Hardened Properties of Steel Fiber Reinforced Concrete using ANN <i>R. R. Mahesh and Dhanya Sathyan</i>	099
RASM 5018	Tensile Behavior of Pre-Stress Corroded and Post Hydrogen Embrittled Spring Steel <i>Basukumar H K and Arun K V</i>	100
RASM 5021	Experimental Study on the Stability and Flame Characteristics of LPG Flames in O ₂ /N ₂ and O ₂ /CO ₂ Environment <i>Zeenathul Farida Abdul Gani, M Jinnah Sheik Mohamed, Joe Patrick Gnanaraj S, Muthusaravanan N and Ariyanayagam K</i>	101
RASM 5022	Microwave Assisted Synthesis and Single Crystal XRD Studies of Dibromocobaloxime <i>C. Revathi, O. Senthilkumar and S. Soundeswaran</i>	102
RASM 5028	Nanocrystalline Ceramic Oxide CaBiNbO ₆ – An Optically Active Material <i>Fergy John and Shemim S S</i>	102
RASM 5032	Performance Assessment of Valve Regulated Lead Acid Battery for E–Bike in Field Test <i>Jaydeep M. Bhatt, P. V. Ramana and Jignesh R. Mehta</i>	103
RASM 5033	Development of Pavement Quality Concrete with SCM's, Fibers and Graphite <i>Dadi Rambabu, Shashi Kant Sharma and M Abdul Akbar</i>	103
RASM 5034	Comparative Modal Analysis of Cantilever Beam Made of Biocomposites using Finite Element Analysis <i>Pankaj, Suman Kant and C.S. Jawalkar</i>	104
RASM 5040	Effect of Hydrogen Flow Rates on the Performance of Two Biodiesels Fuelled Dual Fuel Engine <i>D.M. Muralidhara, N.R. Banapurmath, M. Udayaravi, C. Prabhakar Reddy and P.A. Harari</i>	105
RASM 5042	Dependence of Secondary Operations in Power Metallurgy and their Impact on the Electrical Resistivity in MWCNT/Cu Nanocomposites <i>Mahesh, Kalyan Kumar Singh, Vishwanath Koti and Prashant Rawat</i>	106
RASM 5047	Symmetries in the Properties of Mixing of Agcu Liquid Alloys at 1423 K <i>Rajendra Prasad Chaudhary, Jagdhar Mandal and Indu Shekhar Jha</i>	106

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 5045	Combustion Synthesis and Luminescence Characterization of Dy ³⁺ Activated Li ₂ Sr ₂ Al ₂ PO ₄ F ₉ Phosphor <i>Tushar R. Shelke, A.P.Fartode, Sonal P. Tatte, S.A.Fartode and S.J.Dhoble</i>	107
RASM 5053	Incinerated Municipal Solid Waste Bottom Ash Bricks: a Sustainable and Cost-Efficient Building Material <i>Pravez Alam, Sanjeev Kumar and DavinderSingh</i>	107
RASM 5046	Experimental Investigation on Strength Properties of High Performance Concrete Produced Using Artificial and Natural Sand <i>D.B.Kulkarni and H.S.Jadhav</i>	108
RASM 5055	Effect of Elevated Temperature on Stress-Strain Behaviour of Self-Compacting Concrete <i>A. Arun Solomon, Mervin Ealiyas Mathews, N. Anand, Tattukolla Kiran, Jayakumar G., B. Siva Kumar Yadav and G. Sudheer</i>	109
RASM 5056	Environmentally Assisted Fracture behavior of Edge and Corner Notched Spring Steel <i>Manjula S and Arun K V</i>	110
RASM 5057	Thermodynamic Analysis of Thermochemical Energy Storage System Based on AB5 Type Hydride Pairs <i>K. Sarath Babu and E. Anil Kumar</i>	111
RASM 5059	Influence of Fibers Hybridization on the Tensile and Flexural Properties of Hemp/Bagasse Reinforced Poly-lactic Acid (PLA) <i>Umi Lailatul Jamilah, S. Sutisna, M. Asrofi and Sujito Sujito</i>	112
RASM 5061	Influence of the Properties of P-A-Si:H Layer and the Work Function of Front Contact on Silicon Hetero junction Solar Cell Performance <i>Niveditha Nair, Varsha. T. Babu, Archana Udayan, Parvathy K S, Arya B R, Gopika S, Anjitha M and Sanjay K. Ram</i>	112
RASM 5069	Synthesis and Luminescence Properties of Ce ³⁺ doped (Sr,Ba) ₂ GeO ₄ phosphors <i>Koneti Srikanth, Lavudi Narsihma, Mangali Narsimulu, Manchoju Satish Kumar, Kunja Laxminarayana and Mudavat Srinivas</i>	113
RASM 5070	Four-Parameter Model for the Thermodynamic and Microscopic Properties of AlCu Liquid Alloys at 1373K <i>Shayista Ahmad, M.P. Sah, R.P. Chaudhary, I.S. Jha and J. Mandal</i>	113
RASM 5072	Effect of Injection Timing on the Performance of Ceiba Pentandra Biodiesel Powered Dual Fuel Engine <i>P.S. Gaddigoudar, N.R. Banapurmath, Y.H. Basavarajappa, V.S. Yaliwal, & P.A. Harari</i>	114
RASM 5076	Structural, Optical and Magnetic Properties of Yttrium Aluminium Bromate (YAB) Nanomaterial, Prepared by Low Cost Sol-Gel Chemical Method <i>Bibhuti Bikramaditya, Rakesh Kumar Singh and Nishant Kumar</i>	115
RASM 5090	Artificial Neural Network Modelling for Average Surface Roughness in Citrate Stabilised Electroless Nickel Boron Coatings <i>M. Vijayanand, R. Varahamoorthi and P. Kumaradhas</i>	116

RECENT ADVANCEMENTS IN SUSTAINABLE MATERIALS

RASM 5092	Preparation and Characterization of Caprine Bone Derived Mineral Substituted Hydroxyapatite/ Phyllanthus Acidus Extract for Biomedical Applications <i>P. Sadiqbasha, R. Sivakumar, M. Arunpandian, C. Ramalingan, D. Gopi and S. Arunachalam</i>	117
RASM 7001	Dislocation and Deformation Analysis of Cu-Ni Thin Films during Nanoindentation using Molecular Dynamics Simulation Approach <i>Anil B. Shinde, Shivanjali Patil, Pooja S Patil, Rohit Salunkhe, Rumana Sande, Sahil Pawar and Vijay Patil</i>	117
RASM 7002	Experimental Analysis on Roof Construction <i>N.K.Mandavgade, N.P.Mungle, S.K.Mandavgade, A.N.Mungle and M.D.Muley</i>	118
RASM 7003	3D Concrete Printing Matrix Reinforced with Geogrid <i>S.Geetha, M.Selvakumar and S. Muthu Lakshmi</i>	118
RASM 7007	Study on Properties of Bio-Bricks <i>Poornima V,Venkatasubramani R, Sreevidya V and Pavan Chandrasekar</i>	119
RASM 4038	Green Synthesis of ZnO and CuO NPs using Ficus benghalensis Leaf Extract and their Comparative Study for Electrode Materials for High Performance Supercapacitor Application <i>Sapna Yadav, Nutan Rani and Kalawati Saini</i>	120
RASM 5006	Comparative Study of Various Flexible Facing Materials for Soil Nailed Slopes <i>Samrity Jalota and Amanpreet Tangri</i>	121
RASM 5082	Structural and Electrical Investigation of ‘Bi’ doped SmFeO ₃ -BaTiO ₃ Perovskite System <i>F. Brahma, R.L.Hota, R K Parida and B. N. Parida</i>	121
RASM 5085	Studies on Usage of Natural Fibers and Eco Sand for Sustainable Concreting <i>Pavithra K, Manisha Shewale, Shraddha Asalkar, Nitin Shinde, Pavankumar Korked Balaji A,Gobinath.R and Anuradha.R</i>	122
RASM 7005	Experimental Study on Light Weight Panel using Phosphogypsum <i>Muthukumar.P, Manisha Shewale, Shraddha Asalkar, Nitin Shinde, Pavankumar Korke, Anitha.M, Gobinath.R and Anuradha.R</i>	123
RASM 7006	Utilization of Plastic Waste and ProsopisJuliflora Ash in Making Floor Tiles <i>Raguraman.V, Manisha Shewale, Pavankumar Korke, Shraddha Asalkar, Nitin Shinde, S.Deepasree, and Gobinath.R</i>	124
RASM 7008	Experimental Study of Single Bed Prototype adsorption Refrigeration Unit Using Low Grade Heat Energy <i>Vikas H Chaudhari and Avanash D Desai</i>	125

1011

Polyaniline-CuO Nanocomposite: Electrical, Structural and Sensor Properties

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Abstract: This paper describes on synthesis and characterization of Polyaniline (PANI) and PANI/Copper oxide (PANI/CuO) nanocomposites. PANI was synthesized using chemical route and PANI/CuO Nanocomposite was prepared using mechanical mixing method. The prepared samples were characterized for FTIT, XRD, SEM, Electrical conductivity and methanol gas sensing properties. FTIR spectra confirm the presence of characteristics peaks of PANI. XRD spectrum indicates the presence of copper oxide nanoparticles in PANI and SEM micrographs presents the distribution of copper oxide nanoparticles in PANI matrix. Electrical conductivity of PANI has been decreased in the presence of different weight percent of CuO. Gas sensing of response of PANI-CuO observed higher compared to pure PANI.

Keywords: polyaniline; fullerene; nanocomposite; conductivity; sensor.

1045

Synthesis and Application of Benzodiazepine Compounds as Corrosion Inhibitor for Mild Steel in Acid Media

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Abstract: Dimethyl-[4-(4-phenyl-2,3-dihydro-1H-benzo[b][1,4]diazepin-2-yl)-phenyl]-amine (DPBD) and 4 Dimethyl-[4-(4-methyl-2,3-dihydro-1H-benzo[b][1,4]diazepin-2-yl)-phenyl]-amine. (DMBD) were synthesized by the condensation of o-phenylenediamine and chalcone catalyzed by sulphated zirconia and characterized by FTIR spectra. Corrosion inhibition property of the benzodiazepines on mild steel in sulphuric acid medium was investigated by Weight loss and Electrochemical methods. The Compound DPBD showed better corrosion protection properties than DMBD both at room temperature and at higher temperatures. The results showed that the compounds act as a good inhibitor and the efficiency increased with increase in their concentration. The adsorption of the inhibitors on the surface of mild steel was found to obey Langmuir adsorption isotherm. Scanning electron microscopic study showed the formation of a protective adsorptive film of the inhibitor on mild steel surface.

Keywords: Mild steel; benzodiazepine; corrosion inhibitors; Polarization studies; Impedance studies; Adsorption Isotherm.

1049

Structural Response of Self-Compacting Concrete Beams under Elevated Temperature

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Abstract: The Aim of the research work is to examine the behaviour of Self-Compacting Concrete subjected (SCC) to elevated temperature. This research work examines the effect of water cooling on flexural behaviour of M25 and M40 grade SCC. The results of the investigation will enable the designers to choose the appropriate material for fire safety considerations. To understand the effect of elevated temperatures on different grades of reinforced Self-Compacting Concrete (SCC) beams an extensive experimental investigation was carried out. The effect of different cover thickness and different percentages of tensile reinforcement were also studied. Ultimate load, deflection, stiffness, and energy absorption capacity of the specimens subjected to temperature based on ISO 834 standard fire curve. The heated specimens were either air or water cooled to evaluate the impact of the type of cooling. The results indicated a significant reduction in strength, Energy Absorption Capacity (EAC) and stiffness in case of higher grade SCC specimens with lower cover thickness when subjected to elevated temperatures. An increase in cover thickness was found to improve the overall fire response of beam specimens. The deterioration of strength properties was found to be dependent on the type of cooling conditions and the percentage of tension reinforcement adopted. SCC being a high performance concrete, it is essential to evaluate the performance under fire conditions. This research work provides the behaviour and physical characteristics of SCC subjected to elevated temperature as per ISO rate of heating. The experimental data will enable the engineers to estimate the capacity of fire affected SCC.

Keywords: Beam; Concrete; Heat; Self Compacting; Strength.

1050

Development and Strength Assessment of Sustainable High Strength Fiber Reinforced Concrete

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Abstract: Recent developments in the infrastructure urged the requirement of developing concrete with high performance. This research work presents the development of sustainable High Strength Fiber Reinforced Concrete (HSFRC) and its mechanical properties such as compressive strength, tensile strength and flexural strength compared to conventional High Strength Concrete (HSC). Ordinary Portland Cement (OPC) was replaced with an optimum amount of Micro-Silica (MS) and Pumice Powder (PP) by 15% and 10%. Hybrid Fibers (HF) are added to the mix of 1.5% by volume of concrete. The fibers used are Steel Fiber (SF), Poly-Propylene Fiber (PPF), Basalt Fiber (BF) and Carbon Fiber (CF). The effect of fiber and its performance is compared with conventional HSC. A concrete mix with the optimum content of ingredients is desired to satisfy the strength and workability. The compressive strength of the mix with HF combination of SF and PPF is found to be higher than other mixes. Mix with SF and BF exhibited higher tensile strength. The contribution of fibers was confirmed by SEM analysis.

Keywords: High strength concrete; Pumice powder; Micro-silica; Compressive strength; Tensile strength; Flexural strength.

1058

Vegetative Voltaic Cell from Ethanolic Leaf Extract from *Prosopis juliflora* Plant

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Abstract: This study investigated the bio-electro-chemical cell behaviour of ethanolic leaf extract of *Prosopis juliflora* as a electrolyte in vegetative voltaic cell. The phytochemical constituents analysis performed using performance liquid chromatography HPLC in association with standard screening test. In this model Tin, Silver, Platinum and Copper coated electrode utilized for measuring voltage as a function of ionic current density. Due to the chemical constituents present in ethanolic leaf extract of *Prosopis juliflora* diluted electrolyte, there is a movement of ions between the anode and cathode. By changing the gap between anode and cathode the developed potential measured and compared for different electrodes.

Keywords: Non-conventional energy; carbon based green electrolyte; Prosopis juliflora; Voltaic cell

1061

X-ray Structure of 4-Aminopyridinium-Oxalate-Oxalic Acid-Hydrate (1/1/0.5/0.5) and Its Characterization

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Abstract: Single crystals of 4-Aminopyridinium-Oxalate-Oxalicacid-Hydrate (1/1/0.5/0.5) ($C_5H_7N_2^+ \cdot C_2HO_4 \cdot 0.5 C_2H_2O_4 \cdot 0.5 H_2O$) grown by the slow evaporation method. The crystal crystallized in the triclinic crystal system and the cell parameters ($a= 3.7110(6) \text{ \AA}$, $b= 9.5021(18) \text{ \AA}$, $c= 15.294(2) \text{ \AA}$, $\alpha= 73.215(7)^\circ$, $\beta= 84.243(7)^\circ$, $\gamma= 81.025(8)^\circ$ and $Z=2$) determined from single crystal X-Ray diffraction. The carboxyl O atom of the oxalate anion link the 4-Aminopyridinium cation, semioxalic acid and semi hydrate molecule. The crystal packing stabilized by $O_{\text{hydroxyl}}-H \cdots O_{\text{carboxyl}}$, $N_{\text{amino}}-H \cdots O_{\text{carboxyl}}$ hydrogen bonding and further stabilized by very weak C-H...O hydrogen bonding. In the title compound, hydrogen oxalate and hydrate molecule disordered over two positions of equal occupancy. The functional groups identified from Fourier Transform Infrared (FT-IR) spectrum. The Ultraviolet (UV) absorption takes place at 277 nm.

Keywords: 4-Aminopyridine, Oxalic acid dihydrate, Crystal structure, Disorder, UV spectrum.

1071

Enhanced Concrete Performance in Cracking Resistance and Chloride Penetration using Hybrid Fiber Blends

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Abstract: The fracture response and resistance to chloride penetration of concrete reinforced with discrete steel fibers (SF) and hybrid blend of steel and macro polypropylene fibers (HyFRC) are evaluated. Cohesive stress-crack opening ($\sigma-w$) relationships are obtained from the the fracture test. A significant improvement in fracture response is obtained in HyFRC compared to SF. An improvement in tensile strength is also evident in HyFRC when compared to SF. The hybrid fiber blend has a higher tensile strength and a significantly higher stress resistance to crack opening when compared to an identical volume fraction of steel fibers. HyFRC also exhibit a lower chloride penetration when compared to control and SF concrete mixtures. The hybrid blend of steel and polypropylene fibers would therefore produce an overall improvement in the performance of concrete..

Keywords: Steel fibers; macro polypropylene; fracture response; cohesive stress; hybrid; blend.

1072

Optical and Upconversion properties of Bismuth Tellurite Glasses Co-doped with Er^{+3} - Yb^{+3} Ions

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Abstract: Heavy glass system (HGS) with batch compositions TeO_2 - Bi_2O_3 - Na_2O co-doped with rare earth ions Er_2O_3 & Yb_2O_3 is synthesized by melt-quench and press method. The batch composition is taken $(80-x-y)\% \text{TeO}_2$ - $10\% \text{Bi}_2\text{O}_3$ - $10\% \text{Na}_2\text{O}$ - $x\% \text{Er}_2\text{O}_3$ - $y\% \text{Yb}_2\text{O}_3$ and (x, y) are $(0.1, 0)$ and $(0.5, 0.5)$. Thermal study of the synthesized sample is done by Differential Scanning Calorimetry (DSC). Amorphous nature of samples is characterized by X-Ray diffractogram. Heaviness of the samples justifies by the densities of the glass samples. For the study of optical properties, Refractive index (R.I.), Optical energy gap (Eg), Urbach's energy (Eu) absorption spectroscopy in ultra violet-visible-Infrared (UV-VIS-IR) region carried. For upconversion(UC) characteristics photoluminescence spectroscopy studied.

Keywords: Upconversion; Heavy glass system; Refractive index.

1086

An Investigation on the Performance and Viability of a Hybrid Twisted Blade Profile for a Horizontal Axis Micro Wind Turbine

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Abstract: With the ever-growing concern about green and clean energy, one of the most viable options is wind power. Though the concept of a micro wind turbine is not new, exploring the best blade profile that would improve the performance is quite challenging. An ideal blade profile for a roof-mounted micro wind turbine could be the one that would offer the lift at the lowest available wind velocity. This paper presents such a proposal wherein a hybrid twisted blade profile modelled out of NACA4412 and E193 airfoils are used for the investigation. Three different profiles viz. a simple tapered blade (NACA 4412), a twisted tapered blade (NACA4412) and a hybrid twisted tapered blade (Hybrid of NACA4412 and E193) are considered and tested using CFD tool followed by experimental validation using a simple tapered blade in a wind tunnel. The test parameters included different air velocities (2 m/s to 8 m/s) at different angles of attack (-10° to $+10^\circ$). The results indicate that the hybrid profile gives superior lift coupled with better structural stability and hydrodynamic power.

Keywords: HAWT; Wind power; Airfoil, Lift; Drag; Hybrid Blade.

1088

Preparation of UV, LASER and White Light Sensitive Conducting Polymer Poly (3, 4-ethylenedioxythiophene) “PEDOT” Nanoparticles

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Abstract: Conducting polymer (CP) poly (3, 4-ethylenedioxythiophene) (PEDOT) is synthesized by in situ chemical oxidation polymerization of [3, 4-ethylenedioxythiophene](#) (EDOT) monomer using $(\text{NH}_4)_2\text{S}_2\text{O}_8$ (ammonium persulfate - APS) as oxidant. The prepared CP has characterized by FTIR, UV-vis and X-ray spectroscopy. Morphology has studied by SEM and TEM techniques. Presence of identity bonds on the FTIR spectrograms ensures the formation of PEDOT CP. XRD pattern shows the amorphous nature of CP. UV-vis spectra ensures the UV absorbing nature of PEDOT at wavelength 333 nm with absorbance of 1.366 and at 800 nm with absorbance of 1.38. XRD pattern show the polycrystalline nature of PEDOT. SEM image shows the nanostructure of PEDOT having presence of nano granules (< 100 nm) on its surface. TEM images show the presence of nearly spherical NPs having dimension below 50 nm. The prepared PEDOT is much sensitive for radiations like UV, white light and LASER. The remarkable change in electrical conductivity has shown by PEDOT in the exposure of UV, white light and LASER radiation. At low intensity (2000 lx) of UV irradiation the conductivity of $1.21 \times 10^{-4} \text{ Scm}^{-1}$ has shown by PEDOT compare to other sources of irradiation.

Keywords: PEDOT, Nanoparticles, UV absorbance.

1090

Efficacy of Photoluminescences and Magnetic Behavior of Ce Doped ZnO Nanoparticles by Solid State Reaction Method

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Abstract: The synthesis of Ce doped ZnO nanoparticles exhibits the enhancement of results and its favor to electronic properties. The minimum average crystal size was obtained from 8 wt% (8 nm). The weight percentage (wt%) of cerium doping concentration increases, average crystal sizes are decreased upto 8 wt% and then crystal size increased for 10 wt% of doping level. The UV-Visible spectra analysis shows that the high absorbance and broad peak obtained at 8 wt%. PL studies exhibits the enhanced intensity of the broad emission at green region confirms that the increased density of defects which can be attributed to the oxygen vacancy created by the existence of Ce doped in ZnO nanoparticles. At last we got minimum band gap energy value of 1.32 eV at 8 wt.% of Ce doped ZnO nanoparticles. VSM studies showed room temperature ferromagnetism in the Ce-doped ZnO NPs. The polarization esteems are seen as diminished with the expansion in Ce fixation in ZnO after 4wt.% and 6wt.% Ce. The watched ferromagnetism in Ce-ZnO NPs is because of the nearness of Ce³⁺ particle state and oxygen opening and interstitial destinations of Zn.

Keywords: Ce; ZnO; Nanoparticles; XRD; Solid State Method; Optical properties; Magnetic Properties;

1091

Effect of Oxidants and Dopant on Morphology, Crystallinity and Optical Absorbance of Nano Structural Polyindole

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Abstract: We prepared the nanostructuralpolyindoles S₁, S₂, S₃ and S₄ (Pinds) by chemical oxidative route using anhydrous Iron (III), at both $\pi - \pi^*$ band and n- π^* band with the use of dopants while synthesis. Decrease in particle size (< 100 nm) of S₂ compare with S₁ examined by SEM images (surface morphology). Small sized particles are observed in sample S₃ compared to sample S₁ with chloride (ferric chloride - FeCl₃) and (NH₄)₂S₂O₈ (ammonium persulfate - APS) as oxidants and H₂O₂ (Hydrogen peroxide) as a dopant. shift for UV absorption peak in case of S₂ compare to S₁, and also on the spectra of S₂ there is bathochromic and hyperchromic shift in IR region which may be effect of APS as oxidant while polymerization. Hypsochromic shift is observed for samples S₃ and S₄the use of H₂O₂ as dopant. SEM image of S₄ shows the presence of aggregation of particles up to some extent so that sheets like structure is observed. Presence of Cl⁻ in polymer matrix ensured by 4.64 wt% Cl on EDAX of S₁, presence of SO₂⁻ or SO₃⁻ or SO₄⁻ in polymer matrix ensured by 13.1 wt% oxygen and 2.89 wt% sulphur on EDAX of S₂. Presence of Cl⁻ in polymer The Pind samples are characterized by FTIR, UV-vis and XRD spectroscopy. The morphology of said samples has been examined by electron microscopy, SEM and TEM. The FTIR spectrographs enriched with bands shows various bond absorptions which gives the identity of Pind. UV-vis spectra of S₁ shows the absorption peaks in both regions, UV and visible. Using oxidant as APS, the sample S₂ spectra shows the absence of absorption peak in the visible region. The use of APS as oxidant gives the bathochromic and hyperchromicmatrix is confirmed by EDAX of S₃ and presence of SO₂⁻ or SO₃⁻ or SO₄⁻ in polymer matrix is confirmed by EDAX of S₄. Increase in crystalline nature, formation of nano crystallites and removal of nanowires structure reveals by the XRD pattern of S₂ due to APS as oxidant. Nanoparticles surrounded by polymer nanowires are shown by TEM image of S₁. Nano crystallites embed spherical particles (> 100nm) are shown by TEM image of S₂. Small sized particles are observed in sample S₃ (Pind/FeCl₃/H₂O₂) compared to sample S₁. In the present study we tried to find that how nature of oxidant affects the morphology, crystallinity and optical absorbance of Pind.

Keywords: Polyindole, nanostructural polymer,, conducting nano crystallites, nanowires;

1092

Advance Recovery Approach for Efficient Recovery of Waste Lubricating Oil by Different Material Formulations

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Abstract: The rapid growth of population with increased facilities for comfort nowadays is leading to a drastic depletion of natural resources. The present work emphasizes the re-refining process of waste lubricating oil by the solvent-extraction flocculation process. Re-refining is considered by many as a preferred option in terms of conserving resources, as well as minimizing waste and reducing the environmental hazard to a great extent. The effect of various parameters like refining time, refining temperature, solvent to waste oil ratio, flocculant dosage, adsorbent to distilled oil ratio has been elaborately studied, and the optimum yield percent was obtained at 33°C after 20 minutes of refining with a solvent to waste oil ratio of 5:1 (w/w). Various solvents like iso-butanol and n-butanol were used, and iso-butanol was found to produce a higher yield of 72%, which is 2% higher than the solvent n-butanol. Calcium hydroxide was used as a flocculant, and a concentration of 2 kg of flocculant per kg of solvent was found to be optimum. The flashpoint, carbon residue, and viscosity index was found to be 209°C, 0.93 g, and 132.7, respectively, which is quite comparable to virgin lube oil. The purity and in the existence of oxidation products was elaborately analyzed by FTIR and GC-MS analysis. Thus the refined oil obtained can effectively mitigate the ever-growing oil crisis and can help in the creation of a healthy and pollution-free environment..

Keywords: Lubricant; solvent; flocculant; re-refining; FTIR; GC-MS.

1093

Structural, Morphological and Optical Studies of CdSe Quantum Films Synthesized by Ultrasonic Vibration Assisted Drop-Casting Method

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Abstract: Herein, the synthesis colloidal CdSe nanoparticless stated by thermolysis of a polymeric complex, [$C_5H_3(Br-3)NSe$]₂Cd synthesized by thereaction of NaSeC₅H₃(Br-3)N and CdCl₂, through hot-injection method by using an economical and mildreagent, oleic acid (OA), as the coordinating solvent as well as capping agent. The average size of colloidal CdSe is ascertained using DLS, and is found to be 40.69 nm. Colloidal CdSe nanocrystals are deposited as quantum films onto a glass surface by using “ultrasonic vibration assisted drop-casting” (UVADC) method so as to investigate their further use as functional materials in device fabrication. The quantum films are characterized by Ultraviolet-Visible (UV-VIS) spectroscopy, SEM (scanning electron microscopy) and X-Ray diffraction (XRD) techniques.

Keywords: Colloidal nanoparticles, hot-injection method, ultrasonic vibration assisted drop-casting, quantum films.

1098

Third Order Measurements, Thermal and Mechanical Stress Tolerance Studies of a Nonlinear Borate Family Hybrid Crystal towards Optoelectronic Applications

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Abstract: Highly transparent nonlinear Thiourea cadmium hydrogen borate (TCHB) single crystal grown by slow evaporation method is investigated for optoelectronic applications. Single crystal XRD provides details about the lattice structure. FTIR vibrational spectroscopic study identifies the functionals that make up the crystal system. Elemental composition is determined from the EDAX spectrum. UV spectral analysis is performed to determine the transparency range, absorption edge limit, and band gap value at which the crystal can be run. The linear behavior of TCHB is analysed by studying the optical constants from the transmittance values. TG/DTA analysis is done to find out the thermal stability. Vickers microhardness test classifies TCHB as a soft material and elasticity, brittleness and other mechanical properties are assessed from the hardness value. Second harmonic optical study affirms frequency doubling of Nd:YAG laser. Third order measurements, such as, nonlinear absorption co-efficient (β), nonlinear refraction (n_2) and third order susceptibility (χ^3) are calculated by the Z scan technique

Keywords : Borate family crystal; EDAX study; UV Spectral study; Thermal study; Vickers microhardness; Third order measurements.

2004

The Use of Entropy-Based GRA Approach to Analyze and Optimize the Wire Electrical Discharge Machining Process for Nitronic-30

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Abstract: Efficient and cost effective utilization of WEDM process is a challenge for leading edge era of manufacturing because of the complex and non-linear behavior of the process. The current study focuses on an experimental inquiry carried out for WEDM of Nitronic-30 to obtain optimum process parameters for improved surface roughness (SR) and material removal rate (MRR), Nitronic-30 is austenitic stainless steel offers high strength with good corrosion resistant property which high potential in applications such as automotive parts, aqueous applications, solid handling equipment. Therefore, multi-response optimization of Nitronic-30 on WEDM is very essential. Experiments were carried out with Taguchi's DoE and a L9 orthogonal series, with machining parameters like pulse on time (Ton), pulse off time (Toff), and peak current (IP). Minitab-17 software was used to evaluate response variables such as material removal rate and surface roughness. Analysis of variance (ANOVA) and SN Ratio plot of GRG indicates that peak current is the most important parameter. Grey Relational Analysis (GRA) provides optimal process parameters like pulse on time 124 machine units, pulse off time 40 machine units and peak current 230A for optimal response variables as 4.019 μm SR and 8.683 mm³/min MRR.

Keywords: WEDM, Nitronic-30, GRA, multi-response optimization, Analysis of Variance;

2007

Thermal and Optoelectrical Properties of Cobalt Doped and Undoped Strontium L(+) Tartrate Pentahydrate Single Crystals

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Abstract: Single crystals of intrinsic strontium L(+) tartrate pentahydrate (IST) and cobalt doped strontium L(+) tartrate pentahydrate (CoDST) are grown by gel diffusion technique with the growth parameters optimized to lab temperature of 23.5°C. Stoichiometric composition and the cationic distribution of the crystals are determined from EDAX technique. FTIR and Raman spectral analyses reveal the presence of water molecules, O-H, C-H, C-O, C=O and C-C bonds in the crystals. Thermogravimetric analysis confirms that the crystals attain thermal stability in oxide state through four stages of decomposition, undergoing weight loss in each stage. While IST crystal material possesses a chemical formula: $\text{SrC}_4\text{H}_4\text{O}_6 \cdot 5\text{H}_2\text{O}$ with a molecular weight of 325.77, the CoDST crystal is seen to possess a chemical formula: $\text{Sr}_{0.9836}\text{Co}_{0.0164}\text{C}_4\text{H}_4\text{O}_6 \cdot 5\text{H}_2\text{O}$ with a molecular weight of 325.29 and having a cationic distribution ratio of $\text{Sr}^{2+}:\text{Co}^{2+} = 59.98:1$. Thermal studies also reveal the pentahydrate nature of both the crystals. UV-Visible spectral studies, in the range of 190-1100nm, show that both the crystals are transparent to visible region. Optical transmittance of 97.8% of the IST lattice is observed to have increased to 98.91% on account of doping. Consequently, the optical band gap energy of 5.623 eV of IST lattice is decreased to 5.55 eV on account of doping. Due to doping of Co^{2+} ions, CoDST crystal is observed to possess a relatively lower leakage resistance and higher conductivity as compared to those of IST crystal, for the range of applied voltage of 0-200V.

Keywords: Doped; Electrical; Elemental; Intrinsic; Optical; Thermal.

2011

Multiobjective Optimization of Thermophysical properties of Indonesian Fly-ash Nanofluid

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Abstract: Nanofluids with thermal and viscous tunable properties are seen to be smart fluids of the future generation. In determining the viscous and heat transfer characteristics, the concentration of nanomaterials is important. Generally, an optimal concentration of nanomaterial is needed to design a sustainable and cost-effective heat transfer process. This study includes modeling and optimization of various thermal and viscous temperature-dependent characteristics for differing nanofluid concentrations. The nanofluids containing fly-ash nanoparticles dispersed in water are used in this work. The Response Surface Methodology (RSM) is used to model and optimize the thermophysical properties of nanofluids. The higher volume of nanoparticles in the solution not only increases the heat transfer but also increases the fluid's viscosity leading to higher energy requirements for transportation. The study's key objective is to find the optimal fly-ash nanoparticle concentration and thermophysical characteristics. Temperature and volume concentration were considered as input parameters, while viscosity, thermal conductivity, specific heat, and density were selected as a response. The optimum value for viscosity, thermal conductivity, specific heat, and density are estimated as 0.686725 W/m °C, 0.0466536 Pa.s, 984.368 kg/m³ and 4040 j/kg °C for the input value of 60 °C and 0.1041741 percent nanoparticle loading.

Keywords: Fly-ash; water dispersion; Nanofluid; Optimization; RSM;

2019

Impact of Mach number on the Flow Pattern in Suddenly Expanded Duct

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Abstract: A study is undertaken to assess the dynamic control's effectiveness at two supersonic Mach numbers, 2.2 and 2.58 being considerably large Mach number being very significant in the design of High-speed aerospace vehicles. The relief available to the flow while the shear layer exits from the nozzle and enters the enlarged duct. The investing area ratio is 4.84, and the NPR tested is from 3 to 11, covering the various level of expansion. The investigation was done for eight sizes of the circular duct cases. Still, the results are discussed only when a significant change in the wall pressure is noticed during the experimentation. The dynamic control is located at a 0.0065 m distance from the primary jet's axis, with a 1 mm diameter generating at sonic Mach from the active flow control management. For lower duct length at NPRs, the wall pressure assumes large values. Later, with a rise in the duct section and NPR, a progressive decline in the pressure values is seen due to the decrease in adverse pressure level and the intensity of the oblique shock waves. The duct flow mild oscillations are seen for duct section 3D, 5D, 6D, and 10D. The duct length portrays a crucial role while determining the stream development in the enlarged circular tube. When the duct's size is 6D and 10D, the low wall pressure is seen. For NPR = 5, the wall pressure takes moderate values due to the influence of the tube. At NPR = 7, 9, and 11, the pressure rise is limited within the reattachment zone, and ambient conditions are nearly attained within a short duct length. Despite nozzles, they are over-expanded flow control effects in a rise of pressure at Mach 2.58 for duct size 6D and 10D. For the duct size 10D, the attainment of ambient pressure is further advanced towards the upstream.

Keywords: Wall Pressure; Area Ratio; Supersonic Jet; Active Control; Microjets; Sudden Expansion

2031

Migration Induced Localization of Multiwalled Carbon Nanotubes in PP Phase of PP/ABS blend and their Hybrid Composites: Influence on Mechanical and Thermal Properties

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Abstract: Carbon black (CB) and multiwalled carbon nanotubes (MWNTs) reinforced 80/20 (wt/wt) polypropylene (PP)/acrylonitrile butadiene styrene (ABS) blends and its composites in presence of dual compatibilizer are processed using melt-mixing followed by injection moulding. Two-step processing is adopted to mix the MWNTs and CB in polymers. Initially, MWNTs are premixed with ABS using melt-mixing. Further, ABS/MWNTs are melt-mixed with PP, CB, and dual compatibilizer. A solution experiments show the migration of MWNTs in the PP phase; and CB is localized in the PP phase. All the specimens show the formation of matrix-droplet morphology. With the incorporation of MWNTs and CB in 80/20 (wt/wt) PP/ ABS blends and its composites in presence of dual compatibilizer reveal the refinement in morphology (decrease in average droplet diameter and interparticle distance) as compared to pure blend. The percent crystallinity and lamellae thickness of MWNTs and CB filled 80/20 (wt/wt) PP/ ABS blends and its composites in presence of dual compatibilizer increases as compared to pure blend. Refined morphology and crystallization behavior of MWNTs and CB filled 80/20 (wt/wt) PP/ ABS blends and its composites in presence of dual compatibilizer increased the tensile properties significantly. Thermal stability is enhanced significantly for the selectively localized MWNTs and CB in PP phase of 80/20 (wt/wt) PP/ ABS blends and its composites in the presence of dual compatibilizer as compared to pure blend. The 2.5 wt.% of CB filled 80/20 (wt/wt) PP/ ABS blends and its composites in presence of dual compatibilizer and MWNTs is the optimized concentration to achieve the highest enhancement in tensile properties and thermal stability.

Keywords: Polypropylene; Blends; Hybrid Composites; Multiwalled Carbon Nanotubes (MWNT).

2032

Synthesis and Characterization of Acid Treated Reduced Graphene Oxide

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Abstract: Graphene oxide is successfully synthesized using Hummer's method and Hummer's method with additional KMnO_4 . Hummer's method with additional KMnO_4 shows higher oxidation of graphite as compared to Hummer's method. The reduction of graphene oxide using sodium hydrosulfite shows some of functional group remains on the lattice of graphite as clear from FTIR spectra. Further, acid treatment of graphene is carried using H_2SO_4 at 90°C for 90 min, showing removal of functional group of graphene from the surface revealed by XRD and obtaining more pure graphene..

Keywords: Graphene; graphene oxide, acid treatment, graphite.

2035

Profound probing of Groundnut Shell Ash (GSA) as Pozzolanic Material in Making Innovative Sustainable Construction Material

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Abstract: In India, the total Groundnut kernel production is around 25.14 million tonnes. After removing the nut, the body production is about 15% of the kernel which works to 3.77 million tonnes. In the Age of Advanced Technology, the utilization of wastes by proper management is inevitable for making a conducive environment. In this research, Ground Shell Ash (GSA) was taken for intensive analysis for making suitable and innovative sustainable construction materials. The GSA when used in the making of unburnt bricks gives a satisfactory result. The strength obtained under optimum combination was found greater than the prescribed value for first-class brick. Various other tests on bricks such as water absorption, efflorescence, permeability, and leaching were carried out and obtained a satisfactory result. The GSA brick will be commercially viable building materials and also will be cheaper as it does not require any burning. In this way, a sincere attempt was made to find innovative, suitable, durable, economic alternative construction materials by means of unused waste materials from leading Industries.

Keywords: Concrete, Bricks, pozzolana, partial replacement, groundnut shell ash (GSA), Fly ash.

2044

Chromium Oxide Regulated Nanoparticles Biosynthesis in Manihot Esculenta Leaf Extract

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Abstract: The green synthesis of nanoparticles using plant extracts plays an important role in the field of nanotechnology. The potential of biomolecules present in plant extracts to reduce metal ions to nanoparticles in a single step of green synthesis process is very important. In this study we report on synthesis of Chromium oxide nanoparticles (Cr_2O_3) by reduction of potassium chromate solution with Manihot esculenta leaf extract. The presence of water soluble carbohydrates which have an aldehyde group may leads the formation of Cr_2O_3 nanoparticles. The synthesized chromium oxide was characterized by UV-Vis spectroscopy, X-ray diffraction (XRD), Fourier transform-infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM). XRD and UV-Visible absorption confirms the presence the nanoparticles. The images showed that the size of NPs of Cr_2O_3 varied with average crystalline size 80-100 nm. of nanosized Cr_2O_3 . TGA verifies that the Cr_2O_3 NPs are thermally stable upto 1000 °C.

Keywords: Bio synthesis; Manihot esculenta; Chromium oxide; potassium chromate solution

2051

The Effect of Cutting Fluid in Improving the Machinability of Inconel 718 using Ceramic AS20 Tool

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Abstract: Industries demand a vast usage of superalloys in heat resistant and high temperature applications. These include nozzle of rocket fuel engines, throttle valve of turbojet engines, turbine blade discs of aerospace industries, rivets and fittings of chemical and production industries, biomedical applications in super strength resistive steels. These superalloys such as Inconel 718 finds its vast applications in all such industries. To machine such materials a lot of wear and tear occurs at the cutting tool. Hence, cutting fluid helps in reduction of tool wear and improving surface roughness. In this paper, two cutting fluids Koolkut 40 and Hicut 590 have been used in emulsified form during the machining of Inconel 718 with Ceramic cutting tool. Hicut 590 has been seen a better heat resistive cutting fluid in reducing the tool wear and thus improving the life of the tool.

Keywords: Inconel 718; Ceramic; Hicut 590; Koolkut 40;

2053

Experimental Evaluation of Sorptivity for High Strength Concrete Reinforced with Zirconia Rich Glass Fiber and Basalt Fiber

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Abstract: Concrete in structures is subjected to various environmental loads such as chloride attack, sulphate attack, and gases during its life. Concrete being weak in tension loses its tensile strength on account of these loads and distress in concrete appears in the form of cracks leading to corrosion of reinforcing steel. The service life span thus of an RCC structure is impaired. To enhance the concrete strength particularly in tension, in this research work, zirconia rich glass fiber, and basalt fiber with 1:1 combination of 12mm and 18mm standard cut length with 0.8, 1.2, 1.6, 2.0, and 2.4% by cement weight are used in high strength concrete. Experimental studies are performed on fresh concrete for workability and hardened concrete specimens for demoulded density, compressive strength, pulse velocity, percent voids, and sorptivity after 28 days of normal curing. It is found that 1.2% glass and basalt fiber have the same effect on the workability but a higher percentage of glass fiber produces a lower slump than basalt fiber. The optimum percentage of glass fiber and basalt fiber in this study are found to be 1.2% and 1.6% respectively which impart maximum compressive strength by 10.20% and 11.70% as compared to their reference concretes. Concrete with combined basalt fiber is found to possess a lower coefficient of sorptivity than glass fiber. The same trend has been found in the percentage voids of these concretes.

Keywords: High strength concrete; Durability; Zirconia rich glass fiber; Basalt Fiber; Superplasticizer

2059

Study of Radiation Shielding Materials on Microstrip Patch Antenna for Sustainability

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Abstract: The development of high-frequency wireless communication like 3G or 4G via microstrip patch antennas made of copper subject material has driven the emanation of harmful ionizing electromagnetic radiations as copper is a particularly extremely high electromagnetic conducting material. This radiation has a high effect on the environment which will motivate life-threatening to humans, and the natural world. Moreover, the mentioned radiation due to upcoming ultra-high frequency 5G wireless communication will decline the life of humankind and the surroundings causing more rise in Global warming because of heating of earth's atmosphere through combos of ultraviolet (UV) waves, X-rays, Gamma Rays and RF waves as these waves in assortments will generate electromagnetic heat waves at super-high frequencies. In this research study, using FEKO software the authors have designed, examined and compared microstrip patch antennas made of radiation shielding materials with that of commonly used copper material patch resonating at 2.4 GHz and 26 GHz placed on the frequently used fabrication ease and low-cost substrate such as FR-4, and Rogers RTDuroid 5880. The findings show that the radiation power level diminishes after the usage of microstrip patches made up of radiation shielding materials thus indicating electromagnetic radiation emitted by radiation shielding materials are eco-friendly and will also be sustainable for the environment and living beings. The efficiency of the proposed microstrip antenna with regards to return loss and bandwidth is showing improvements with each radiation shielding materials as microstrip patches with that of copper material.

Keywords: electromagnetic radiations; radiation shielding materials; wireless communication; substrate; environment; microstrip antenna, sustainable

2068

Configuration of Phosphorus Doping in Silicenenanoribbons in the Presence of an External Electric Field

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Abstract: Silicenenanoribbons have been studied a lot in recent years, it is a nanostructure with enormous applications. The doping of another element into the unit cell changes the electrical and magnetic properties of the material, which creates new research directions in materials science. Based on the DFT theory, this work studies the doping phosphorus atoms and in silicenenanoribbons in the presence of an external electric field of about 0.1 V/Angstrom. The work also limited the doping study in two cases: The doping case of one phosphorus atom and the 100% doping configuration. There are two doping positions of a phosphorus atom, the top position, and the valley position, and the formation energy will find the optimal position. The energy band structure and state density will also be drawn, examined, and compared..

Keywords: Silicenenanoribbons; electric field; phosphorus doping; top position; valley position.

2069

Ion Transport Property Studies of a New TiO₂ Dispersed Na⁺ Ion Conducting Nanocomposite Polymer Electrolytes

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Abstract: Ion transport property studies of a new Na⁺ ion conducting nanocomposite polymer electrolytes (NCPEs): (1-x) [75PEO:25NaPO₃] + x TiO₂ where 0 ≤ x ≤ 18 wt.%, are reported. The present NCPEs films have been casted using a recently developed hot-press method. The maximum ionic conductivity ($\sigma \sim 2.3 \times 10^{-5} \text{ S.cm}^{-1}$) have been obtained at the composition: [95(75PEO:25NaPO₃) + 5 TiO₂] and this has been referred to as optimum conducting composition (OCC). Ion transport properties have been explained with the help of some basic ionic parameters viz. ionic conductivity (σ), ionic mobility (μ), mobile ion concentration (n) and ionic transference number (t_{ion}). To compute the activation energy (E_a) values of different samples, temperature dependent ionic conductivity studies have been done. Solid state polymer battery was fabricated using the NCPE OCC as an electrolyte and studied their cell performances.

Keywords: Nanocomposite polymer electrolytes, ionic conductivity, ionic transference number, activation energy, polymer battery.

2074

Enhancement on the Properties of Recycled Coarse Aggregate through Bio-deposition – An Experimental Study

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Abstract: Owing to increased population and industrial expansion, the necessity for aggregates in construction is growing rapidly. Conversely, the production of aggregates results in the degradation of natural resources, posing a threat to the construction industry's long-term viability. To counteract the above concerns, the use of recycled coarse aggregates (RCA) as a suitable replacement to natural coarse aggregate (NCA) was developed. However, the adherence of mortar on the RCA exhibit higher porosity and that affects the quality of the RCA. So, in this study, the quality of RCA was enhanced through the bio deposition approach by *Bacillus Subtilis* and *Bacillus Sphaericus*. The microbes precipitates the CaCO₃ that deposit on the RCA and fills the pores on the surface of it. The mechanism resulted in the reduction in the water absorption and increase in the mechanical properties of the RCA. Microstructure investigations affirm the precipitation of CaCO₃ by bacterial species that improves the quality of RCA.

Keywords: Recycled coarse aggregate, adhered mortar, *Bacillus Subtilis*, *Bacillus Sphaericus*, water absorption, CaCO₃ precipitation

2091

Structural Characterization and Investigation of Magneto-Optic and Multiferroic Properties of Nanostructured CoFe_2O_4 Prepared by Sol-Gel Derived Facile Chemical Route

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Abstract: The high purity crystalline CoFe_2O_4 nanomaterials was prepared by a sol-gel derived facile route at 800°C for 3 h. The XRD, SEM, FTIR spectroscopy, PL analysis, Uv-Visible spectroscopy, VSM and Precision multiferroic system were used for characterizations of the material. XRD identified the development of the cubic phase with a crystallite size of 25.68 nm. The wavenumbers of molecular vibrations were detected using FTIR spectroscopy between 464 and 3440 cm^{-1} , where Fe-O and Co-O bond at 464 cm^{-1} and 579 cm^{-1} , respectively, point to the spinel phase yield of CoFe_2O_4 . The direct and indirect band gap was found 3.88 and 3.80 eV, respectively. The PL spectroscopy revealed emission wavelength between 457- 519 nm at room temperature. The sintered nanoparticles were observed with a mean grain size of approximately $1.86\text{ }\mu\text{m}$ by SEM analysis. The magnetic coercivity of CoFe_2O_4 confirms its hard-magnetic behaviour. The coercivity (H_c), M_s (saturation magnetization) and retentivity (M_r) were found to be 1012 Oe, 83.38 emu/g and 40.67 emu/g, respectively. The coercive field (E_c), remanent polarization (P_r) and saturation polarization (P_s) were observed between 10.97-28.11 KV/cm, 3.52-9.65 $\mu\text{C}/\text{cm}^2$ and 5.94-11.82 $\mu\text{C}/\text{cm}^2$, respectively. The multiferroic constraints exhibited a systematic increase with the increase in applied electric field. The P-E loop resembles a lossy conductor as the loop area is very high. The area increased with the increase in applied electric field, resulting in high leakage current. The high coercivity, moderate M_s , high band gap and photoluminescence of these materials may be accountable for possible applications in the electronics industry.

Keywords: Cobalt ferrite; Phase analysis; Band gap; Magnetic properties; Multiferroic properties

3003

Design of an Impact Attenuator for Passive Safety on Roads

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Abstract: The research is aimed at the study and validation of an impact attenuator to be installed on roads. Its main function is to absorb the energy generated by an impact., therefore, the different regulations (national and international) are analyzed together with the materials that lead to reduce the severity of the accident. From this point, the best material is selected through a decision matrix under specific parameters, the design of the shape of the attenuator using a Pugh matrix ideal for the selection of completely new designs and the dynamic simulation is established to observe the behavior. The modeling of the attenuator geometry is created by engineering software and its geometry itself., it is designed in sections with mitigating elements among them. For the validation of the design, the one with the greatest capacity to dissipate energy is chosen, for this purpose, the behavior of the impact attenuator in the event of a vehicle crash is observed using finite element analysis software, defining simulation variables and varying geometry parameters.

Keywords: impact attenuator; finite elements; mechanical properties; simulation; Campbell's parameter;

3008

Honey Based Hydrogel as Delivery System for Wound Healing

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Abstract: The present study was intended for development of hydrogel-based drug delivery system with wound healing potential. The honey-based hydrogels were prepared by cold mechanical method. Carbopol-940 and Chitosan (75% deacetylated) were used as polymers. Triethanolamine was used as a pH adjuster. Methyl paraben was used as preservative and propylene glycol as an emollient. The developed hydrogels were characterized for pH, viscosity, swelling index, spreadability, drug content, *in-vitro* permeation studies using dialysis membrane and *in-vivo* wound healing activity by excision wound model. The results indicated the acceptability of the prepared hydrogels by the evaluation tests. The *in-vitro* permeation studies showed that release of honey varied according to the percentage of honey and the polymer used in the hydrogels. Formulation F14 was found to be the best formulation with cumulative percent drug release of 90.75% and showed greater rate of wound healing within 12 days. Hence, the results of this research work showed that the developed hydrogels can provide a better delivery system for wound healing.

Keywords: Hydrogels, Honey, Carbopol-940, Chitosan (75% deacetylated), Nano silver water.

3021

Honey Based Hydrogel as Delivery System for Wound Healing

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Keywords: Hydrogels, Honey, Carbopol-940, Chitosan (75% deacetylated), Nano silver water.

3038

Durability and Micro-Structure Studies on Fly Ash and Silica Fume Based Composite Fiber Reinforced High-Performance Concrete

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Abstract: This investigation evaluates the effect of cement being partially replaced by combined fly ash and silica fume with glass fibers and polypropylene fibers as an addition to produce high-performance concrete with composite fiber for resistance to HCl and MgSO₄ acid attack for 30, 60, and 90 days. The water to binder ratios of 0.275 and an aggregate to binder ratio of 1.75 were adopted. Fly ash and silica fume were replaced in the range from 0% to 15% each, glass fibers were added in volume percentages from 0% to 1%, and polypropylene fibers were kept constant at 0.25%. The combined effect of fly ash and silica fume at 5% each as replacement of cement and the addition of composite fiber dosage of glass fiber=1% and polypropylene fibers=0.25% was found to be the optimum combination to obtain maximum acid attack resistance, which was also justified by SEM and XRD analysis done in this investigation.

Keywords: Acid attack; Fly ash; Glass fiber; Polypropylene fiber; Silica fume.

3040

DSSC Using *Wrightiatinctoria* (Roxb.) R Br.:A TRIAL

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Abstract: This paper focuses on the structure of Dye Sensitized Solar Cell (DSSC) engineered using Titanium dioxide (TiO₂) nano-particles sensitized using extract from leaves of *Wrightiatinctoria* (Roxb.) R. Br. TiO₂ thin films are screen printed over flexible Cu foil which serves as the back contact for the device structure. Fluorine doped Tin Oxide (FTO) grown over glass substrate using chemical spray pyrolysis technique is used as the front electrode with KOH as the electrolyte. The optical characterization of the dye is conducted using optical absorption and emission spectroscopic studies. The dye extracted shows a violet photoluminescence at ~ 407 nm which indicated its potential in using it as a material for improving the photon conversion efficiency in the blue region of the solar spectrum. A DSSC of the configuration (Cu|TiO₂| Dye (*Danthapala*)| KOH (Electrolyte)| FTO) was engineered. The electrical parameters of the engineered Dye Sensitized Solar Cell were characterized. The two diode model was used to extract the series and shunt resistance, saturation current and diode ideality factor for the device from the room temperature current-voltage characteristics. The device exhibited a short circuit current of ~ 4.3 x 10⁻⁶ A and an open circuit voltage of 0.011 V.

Keywords: Dye Sensitized Solar Cell; *Wrightiatinctoria*; Flexible Copper(Cu) substrate.

3041

Effect of Particle Damper Technique on Tribological Properties during Hard Turning Process

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Abstract: In turning process, tribological properties is a significant factor that affects production in the manufacturing sector. In the present study, particle damper is used to enhance the tribological properties during turning process. A particle damper is offered by means of particle which dissipate energy through friction and inelastic collisions. A particle damper with variable material, size, and filling in a turning tool is fabricated in this work. A 27 run experiments were conducted to find the effect of particle damping on tribological properties during the turning process. The results were compared without particle damper and found the particle damper suppress surface roughness and tool wear effectively. The particle in the turning tool will collide with one another and increases the rigidity of the tool holder which enhances the tribological properties.

Keywords: Particle damper; Turning process; Surface roughness; Tool wear; Taguchi technique.

3053

Effect of Particle Damper Technique on Tribological Properties during Hard Turning Process

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Keywords: Particle damper; Turning process; Surface roughness; Tool wear; Taguchi technique.

3055

Effect of Welding Conditions and Flux Compositions on the Metallurgy of Welded Duplex Stainless Steel

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Abstract: This research tends to investigate the influence of shielded metal arc welding (SMAW) parameters and flux compositions on the metallurgy of welded AISI 2205 duplex stainless steel (DSS). The consumable was developed using the Al_2O_3 - TiO_2 - SiO_2 flux system as major flux ingredients. The spectrophotometer was used for determining the chemical composition of the base core wire and the base plate. The six different fluxes (F1, F2, F3, F4, F5 and F6, with varied compositions) were coated on a 3.2mm diameter of ER2209 core wire with a coating factor of 1.65mm. Basicity indexes of the six formulated fluxes were calculated to be less than 0.9 for the developed electrodes, which confirmed the electrodes to be acidic coated electrodes. The influence of welding parameters, particularly current on the hardness characteristics of the weldment was established to ascertain the integrity and applicability of the developed consumable. It was evident that the average welding current of 120A at a constant voltage of 22.5V produced high hardness properties of the welded joint of DSS with an optimal heat input of 1.65KJ/mm. The hardness properties in most sceneries were observed to be high at heat affected zone (HAZ) and fusion zone (FZ) than in the base metal (BM) region which is attributed to the ferrite content. The average hardness value of the BM was found to be 241Hv/20, for the FZ and HAZ using the produced electrode F5 and F6 were found to be 250HV/20 and 301HV/20 respectively and for F6 was found to be 259HV/20 at FZ and 336HV/20 at the HAZ while that of the commercial electrode (C) was found to be: FZ-245/HV/20 and HAZ-319/HV/20 which is a good indication of its conformity to standard DSS. The SEM-EDS morphological characterization also reveals the austenite-ferrite phase with relatively coarse grains, inter-critical grains and fine grains at the HAZ regions of the welded joint.

Keywords: *welding current, Heat input, hardness properties, duplex stainless steel, flux coated consumable, SEM-EDS;*

3076

Force Transmissibility of the Viscoelastic Material Used as Vibration Isolation in Power Loom

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Abstract: The vibration and vibration induced noise are the major pitfall in textile machines especially in Power Loom. This research paper provides force transmissibility of viscoelastic material isolator. The isolator is molded with natural rubber with shape as cone and inserted on bottom shaft of the Picking cone of the Power loom. Vibration analysis is carried with Fast Fourier analyzer and application of the Dewesoft software. The Loss factor, damping factor and force transmissibility are determined. Force transmissibility yields effectiveness of vibration isolation of the viscoelastic material. The efficiency of an isolators expressed as the ratio of output displacement or force to input displacement or force and this ratio is known as transmissibility.

Keywords: Fast Fourier Transform spectrum analyser, Picking Mechanism, Isolator, damping ratio, noise, Loss factor.

4001

Tribological Analysis of Al-Si alloy based MMCs at Elevated Temperature

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Abstract: In the current study, investigates the tribological behaviour of aluminium-based MMCs and Aluminium-based HMMCs fabricated through the stir casting process. Reinforcements like Al₂O₃ and SiC are vastly used to enhance the quality of metal facets and reduce the rate of wear. In this work, the matrix metal Al alloy (LM6) is reinforced with 10 wt.% of (Al₂O₃), 10 wt.% of (SiC) & (5%SiC+5%Al₂O₃) to manufacture MMCs & HMMCs respectively, and 1 wt.% of Mg mainly used for wettability of composites. The whole tribological experiment carried out through a computerized Pin-on-Disc setup by varying the input parameters like elevated temperature i.e. 50,100,150 °C, sliding distance i.e. 500, 1000, 1500 m, and sliding velocity i.e. 1,2,3m/s with a constant load of 24.5N. The outcome response is considered as WR (mm³/m) and COF. The observations are designed based on one of the robust methods i.e. Taguchi (L9) orthogonal array. Analysis of variance revealed that both elevated temperature and sliding distance are the most regulating factors compared to sliding velocity. All the observations are conducted at a persistent load of 24.5N and ANOVA revealed that Elevated temperature is an outrageous regulating factor followed by sliding distance, sliding velocity. Elevated temperature is the most influencing factor in HMMCs (Al₂O₃& SiC) whereas both sliding distance and elevated temperature are the regulating factor for MMCs (Al₂O₃/SiC). Finally, worn-out areas of specimens were analysed through SEM and Regression equations value by a confirmation test

Keywords: LM6; ANOVA; MMCs; SiC; Al₂O₃

4003

Comparative Study of Confining Reinforcement Used for the Rectangular Concrete Short Column

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Abstract: The study of rectangular column is significant as it is mostly used in all types of building construction. Transverse reinforcement plays a crucial role in safeguarding the columns, only ties don't provide a uniform level of safety against deformation and damage related to flexural yielding and hence column need be to strengthen by providing different materials as a additional confining reinforcement. In this paper comparative study of rectangular short column with and without confining material is presented. Total thirty columns of different confining materials were tested and results are compared with respect to the ultimate load, ductility, feasibility, cost, vertical and lateral deflection The results show that a confined column increases the ultimate load capacity of the column and also enhances the ductility significantly. Columns confined with fiberglass mesh, nylon polymer mesh was found to be most effective confining materials as compared with other means of confinement.

Keywords: Materials used as confining reinforcement; compressive strength; ductility; slenderness ratio; vertical and lateral deflection;

4005

The Combined Effect of GGBS and Low Volume Fibres on the Low-Velocity Impact and Mechanical Properties of Self-Compacting Concrete

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Abstract: The primary objective of the current research is to evaluate the low-velocity impact behaviour and mechanical properties of low volume fibres reinforced self-compacting concrete made with 30% GGBS as a replacement for cement with a water powder ratio of 0.3. The crimped end steel, basalt and glassfibres of length 22 mm and 30 mm with low volume fractions of 0.25%, 0.5% and 0.75% are used for this investigation. The self-compatibility of concrete is confirmed by the slump flow test. The compressive strength, flexural strength, split tensile strength and low-velocity impact resistance, shear strength were conducted after 28days of water curing. The experimental results show that the compressive strength is only a marginal improvement was observed in the steel fibre reinforce self-compacting concrete mixes. The high tensile, flexural strength and impact resistance were observed in 30% replacement of GGBS with 0.75% of steel fibres of 30mm length. The results of the experiments express that incorporating steel fibres reinforced concrete improves the strength, remarkably splitting tensile, flexural ,Shear and impact resistance strength.

Keywords: Self-compacting concrete (SCC); Ground granulated blast furnace slag (GGBS), silica fumes, steel fibres, Impact resistance.

4016

Development of an Ammonia Gas Sensor Employing an Inter-Digital Capacitive Structure Coated With $Mn_{0.5}Zn_{0.5}Fe_2O_4$ Nano-Composite

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Abstract: Sensing toxic gases in the atmosphere is a great challenge since the selectivity of the sensor for the desired gas should be high enough to detect the particular gas at the ppm level. This work presents $Mn_{0.5}Zn_{0.5}Fe_2O_4$ nano-composite vacuum deposited over an inter-digital capacitive (IDC) structure as an ammonia gas sensing material. The synthesized material is characterized by X-ray diffraction (XRD), Transmission Electron Microscopy (TEM) and Fourier Transform Infrared spectroscopy (FT-IR) to substantiate the crystalline structure and surface morphology of the material. The gas sensing properties of the IDC sensor for ammonia gas are investigated at room temperature. High sensitivity even at extremely low ammonia gas concentrations (of the order of 7 ppm) at room temperature and high selectivity for ammonia gas compared to gases like acetone, ethanol etc., together with low system cost, suggest suitability for developing a new ammonia sensor without using any heating element.

Keywords: Ammonia sensor; Inter-digital Capacitive Structure; $Mn_{0.5}Zn_{0.5}Fe_2O_4$ nano-composite; PVD; XRD;

4024

Flexural Shear Behavior of FRHSC Beams with Fibers only in Shear Span

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Abstract: As per Code of Indian Standards, a concrete having a compressive strength greater than or equal to 65 N/mm^2 is referred to as a high strength concrete. High strength concrete has many favorable properties, but it is a brittle material and has a low rate of increase of tensile strength due to which it is not of great use in earthquake-prone areas. The best method to improve the flexural shear behavior is to incorporate fibers in concrete at the required proportions. This paper investigates the flexural shear behavior of high strength concrete beams by replacing traditional shear reinforcements with steel fibers only in the shear span. The effect of varying volume fractions of fibers (0%, 0.5%, and 0.75%) is also studied. It was found that the brittle failure was converted to ductile failure by fiber addition only in shear span. The load carrying capacity, compressive strength and split tensile of high strength concrete increased with increase in fiber volume.

Keywords: High strength concrete; Flexural shear behavior; Steel fibers; Shear span; Bridging effect

4033

A Simplified Bibliometric Mapping and Analysis about Sustainable Polymers

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Abstract: There is a worldwide trend in the search for sustainable and/or eco-friendly polymers that generate low environmental impacts, aiming to take advantage of waste and raw materials from renewable sources. In line, there is a worldwide concern about the final disposal of solid waste, since its incorrect final disposal is likely to cause serious socio-environmental problems. Thus, great efforts have been made to exchange raw materials from oil, a non-renewable natural resource, for other renewable sources. The panorama of the literature about sustainable/eco-friendly polymers will be discussed in this work, by using bibliometric analysis and mapping based on the results of a search in the Scopus database, focusing on the analysis of the authors' keywords.

Keywords: Sustainable materials; eco-friendly materials; polymer; bibliometric analysis; bibliometric mapping.

4036

Experimental Investigation on Compression Strength of EPOXY/PVC Blend with Different Fibre Glass Reinforcements Using Taguchi's L₂₇ Orthogonal Array

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Abstract: Polymer matrix composites with different fibre glass reinforcements like wool, woven ring and mesh has been prepared through hand layup method for the experimental investigation on compression strength and weight evaluation. EPOXY/PVC blend has been used as matrix material with different weight percentages of PVC such as 5%, 15% and 25%. The prepared specimen has been subjected to heat treatment in an oven for different timing such as 15, 30 and 45 minutes. The present study considers the percentage of PVC, fibre glass type and heating time as input factors to observe their effect over weight and compression strength of the specimen through Taguchi's L₂₇ Orthogonal array. The statistical analysis of experimental results through signal to noise ratio method and ANOVA reveals that the type of fibre used for making the specimen has more influence over both the output parameters. The heat treatment provided to the specimen and the percentage of PVC has no significant effect and the residual error in analysis is around 10%.

Keywords: PVC, Fibre Glass, L₂₇Orthogonal Array, EPOXY/PVC Blend, ANOVA, Compression Strength

4040

Steady-State and Transient Raman Gain Coefficients of Weakly-Polar Magnetoactive Doped Semiconductors

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Abstract: Assuming that the origin of stimulated Raman scattering (SRS) lies in third-order effective (Raman) susceptibility arising due to nonlinear induced polarization, we obtained expressions for steady-state and transient Raman gain coefficients of weakly-polar magnetoactive doped semiconductors under various geometrical configurations. The threshold pump intensity and optimum pulse duration for the onset of transient SRS are estimated. The dependence of Raman gain coefficients on doping concentration, external magnetostatic field, magnetostatic field inclination, scattering angle and pump pulse duration are explored in detail with aim to determine suitable values of these controllable parameters to enhance Raman gain coefficients at lower threshold intensities, and to search the feasibility of efficient semiconductor nonlinear devices based on Raman nonlinearities. Most expectedly, the technological potentiality of weakly-polar magnetoactive doped semiconductors as hosts for compression of scattered pulses and fabrication of efficient nonlinear devices such as frequency converters, Raman amplifiers and oscillators etc. based on Raman nonlinearities are established.

Keywords: Stimulated Raman scattering, Raman gain coefficients, threshold intensity, semiconductor crystals.

4042

Mechanochemical Synthesis of CaTiO₃ Powders: Microstructure and Surface Morphology

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Abstract:

Calcium titanate (CT) is a material that is similar to hydroxyapatite in biological properties. In this report, CT powders was prepared by using high energy planetary ball mill and to determine their phases distribution, microstructure and surface morphology as an effect of milling duration was characterized by XRD,SEM, and BET analysis. As results, XRD, SEM and BET analysis indicate that all the peaks were the CaTiO₃ powders in regular shape and uniformly distributed size of 2 μm in 32 hours. Finally, it can be concluded that with increasing the milling time has significantly influenced and reduced CaTiO₃ crystalline powders after calcinations.

Keywords: Mechanochemical synthesis, CaTiO₃, Thermal analysis, Microstructure, Morphology.

4043

Experimental Investigation on Triple Concentric Tube Heat Exchanger

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Abstract: The subject of this paper is related to the experimental investigation of triple concentric tube heat exchanger. The performance of triple tube heat exchanger is studied under steady state condition. Water at different temperatures were passed through the inner tube, inner annulus and through the outer annulus. The experiment was performed at all possible arrangements. Working fluid used in this experiment is taken as water. The water flow in concentric tube is considered as hot water, normal water and intermediate temperature water. In this experimental investigation the variation of temperature of fluid along the length of heat exchanger has been measured and variations of friction factor and of Nusselt number with Reynolds number is studied. The experimental set up has been fabricated and experimented in the laboratory of Mechanical Engineering Department at BITS indri Dhanbad in India. The installation of triple concentric tube was made by using three tubes of different materials. Aluminium tube was used to make inner tube, Copper tube installed as inner annulus and galvanized iron (G.I) tubes were used to make outer annulus. The best result of this experimental study was found in counter-current arrangement (A2), the value of overall coefficient was 0.42..

Keywords: Heat exchanger, concentric tube, annulus, flow arrangements, effectiveness.

1009

A study on the photo stability of Basella Rubra (Pasalai fruit) Extract with Nano Flower Zinc Oxide.

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Abstract: Recently natural dyes are widely accepted due to its low cost, biodegradability, less toxicity, and non-carcinogenic nature. Many plant and fruit extracts can be used as natural dyes, but its efficiency depends on photo stability and Photodegradation activity. Herein reported photo stability and Photodegradation activity of *Pasalai (Basella Alba)* fruits. Natural dye was extracted from the fruit by the solvent method; it was comparatively cheaper and less toxic. The experiment was performed under UV light and at various temperatures like 40⁰C, 50⁰C, 60⁰C, 70⁰C, and 80⁰C. Results were compared with zinc oxide nanoparticles synthesized with and without solvent. It shows a better photo degradation than pure natural dye extract from *Pasalai* fruits..

Keywords: Natural Dye; Nanoparticle synthesis; ZnO NPs with and without solvent extraction; photostability; Photodegradation.

1031

Structural Analysis of Surprisingly Formed Cu^{II} Cubane through the Specific Cleavage of >C=N- and >C-S- of a Schiff Base Ligand and its Biological Activities

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Abstract: Extraordinary specific breaking of the carbon-sulfur linkage of the thiosemicarbazone moiety from a Schiff base has been watched the blue, bringing about the development of a four coordinated tetra Cu^{II} cubane containing triphenyl phosphine and μ_3 -S as ligands. At the same time, the ketimine group of the Schiff base ligands also got ruptured to regenerate the diketone used for the synthesis of thiosemicarbazone ligand. The synthesized complex was spectrally and structurally investigated. The crystallographic information reveals that the complex is having the shape of a cubane, where as the alternate four corners were occupied by tricoordinated copper and the other corners are by μ_3 -S respectively. μ_3 -S behaves as a ligand which is having the binegative site and neutral site to get bonded with the copper as bridging ligand. Antimicrobial and antioxidant efficacy were explored and shows a better results than the controls used.

Keywords: carbon-sulfur, Cu^{II} cubane, μ_3 -S, thiosemicarbazone, Antimicrobial, antioxidant.

1032

Numerical Simulation of Effect of Geometry, Material on Thermal Performance of Engine Cylinder Fins

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Abstract: The engine is the most important part of an automobile and it is necessary to keep it in working condition for all kinds of temperature conditions. The heat generated inside the combustion chamber needs to be removed to protect the engine from thermal damages and breakdown, in the same instance it also necessary to make sure that it holds the temperature at an optimal requirement for combustion to take place. The cooling efficiency of the fins is subjected to many factors such as the wind velocity, ambient temperature, fin geometry, material of the fin, and the exposed surface area. Although few parameters cannot be controlled, the engine manufacturer intends to manipulate all possible factors, like fin thickness, fin geometry, and fin orientation to attain a desirable outcome. In this paper numerical simulation of the finned cylinder is presented to improve the heat dissipation rate of an engine. The model is prepared using Autodesk Fusion 360 whereas ANSYS is used to conduct steady-state thermal analysis. Numerical simulations are carried out for two different fin materials: Aluminum alloy 204 and 6061. The effect of fin geometry with varying fin thickness, pitch as well as orientation is also analyzed and a detailed comparison for temperature distribution, total heat flux is presented. Our numerical results show that Aluminum alloy 204 performed better than the existing configuration with significant improvements in both, heat transfer as well as in power to weight ratio.

Keywords: Thermal analysis, engine Fin, Simulation, IC engine, Aluminum alloy.

1036

Conducting Polyaniline Doped with Zinc Tungstate Matrix Film as Gas Sensing Composite

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Abstract: Conducting polyaniline (PANI) is doped with a bi-metal oxide, Zinc tungstate ($ZnWO_4$) in chemical polymerization method and composite matrix is sintered on substrate to form a film. The characterization of composite by FTIR spectrum to confirm the formation of emeraldine salt phase of PANI from monomer aniline. X-RD spectra and SEM images to confirm the presence of crystalline $ZnWO_4$ in PANI matrix. The difference in conductivity verses temperature shows exponentially thermal activated behavior, in which conductivity increases with temperature due to curling effect of polymer composite. When exposed to liquid petroleum gas (LPG), due to depletion in the number of conduction electron at the surface and grain boundaries, there is a barrier formation at the interface of sensing films of PANI / $ZnWO_4$ composite, via Fermi energy exchange control mechanism, thereby composite film increases its resistance with LPG concentration..

Keywords: Polyaniline, Zinc Tungstate, Conductivity, Sensor, Gas.

1043

An Analytical Study on Electroosmotic Flow with in a Microchannel Disregarding the Debye–Huckel Approximation

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Abstract: This work studies analytically an electroosmotic flow (EOF) of a Newtonian liquid in a microchannel between two parallel plates. Homotopy perturbation method (HPM) is used to solve the constitutive governing equations. The Poisson-Boltzmann equation for electrical potential distribution is considered. Present work disregards the Debye–Huckel approximation to minimize exactness of present results. Consequently, using the electric potential profile obtained, a modified Navier–Stokes equation is solved for velocity distribution. The energy equation is also altered based on scale analysis to find temperature distribution. Finally, based on the temperature profile Nusselt number is determined. The proposed results are shown in comparison with a numerical and an established result which considers the Debye–Huckel approximation. It is seen that the present results agree well with the numerical predictions for a varied range of zeta potential. But, the established conventional method differs from the numerical result for higher range of zeta potential. Nusselt number is evaluated and shown as function of the electrokinetic length for different zeta potentials. The work finally concludes that the proposed model can be applied for predicting EOF in microchannels for wider range of zeta potential.

Keywords: EOF; parallel plates; analytical solution; HPM; zeta potential; Nusselt number.

1044

Generation of Square Micropattern using Electrochemical Micromachining

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Abstract: Surface microtexturing accomplishes a substantial role in enhancing the interfacial functional performance of machine-driven components. For producing good-quality square micropatterns, maskless electrochemical micromachining (EMM) is a viable option. Maskless EMM is employed for producing micropatterns, wherein the workpiece remains close by interaction with the mask tightly enclosed to the coated tool surface, and the electrolysis of job involves in the enclosed cell. The special micropatterning setup is developed to produce the good quality square micropatterns including micropatterning cell, pulsed electrical unit and perpendicular cross flow electrolyte system. The developed flow method on the job surface in this unit produces better good quality micropatterns. A reused textured tool and developed flow method is applied in maskless EMM in an enclosed unit, which eradicates the sludges and fabricate micropatterns with higher depth. This unique method is an efficient approach for improving the dimensional accuracy of micropatterns. The influences of input criteria, viz. voltage, duty ratio and frequency are studied on surface roughness, current efficiency, length overcut, and textured depth using this technique. The experimental outcomes show that the best parametric combination, viz. 30% duty ratio, 5 kHz and 8V voltage, enhances the micropatterned quality. A study has been approached based on micrographs for attaining the best input criteria combination.

Keywords: Maskless EMM; microtextures; square micropattern; reused masked tool; dimensional accuracy; depth; surface roughness.

1047

Numerical Simulation of Savonius Rotors used for Low Wind Speed Application

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Abstract: Traditionally wind energy is popularly harvested using large horizontal axis wind turbines however their performance is found to be limited for unsteady and low-speed wind flow conditions. On contrary, vertical axis wind turbines are found to be superior for low wind speed conditions, which are generally found in crowded urban areas. This paper aims to present a design and numerical analysis of a vertical axis wind turbine that can be used in small-scale urban applications like wind trees. Hence in this paper, to absorb maximum wind energy available, we have selected wind tree application for which three types of vertical axis rotor design are numerically studied. A Computational Fluid Dynamics simulation is performed on three different geometrical configurations: Savonius helical Bash rotor, simple Saonius rotor, and simple bash rotor to predict their performance. The coefficient of power, coefficient of moment, and power produced by these three rotors are evaluated. A MATLAB-based Simulink model is developed to evaluate the power produced by these three rotors and results are compared with CFD results for validation purposes. From our study, it can be observed that the helical-type Bach rotor performed better than the other two, simple Saonius rotor and simple bash rotor considered..

Keywords: Vertical axis wind turbine, Savonius rotors, Energy harvesting, CFD simulations.

1055

Synthesis of Marigold-like $ZnIn_2S_4$ Microspheres at Low-Temperature

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Abstract: In this paper, Zinc Indium Sulphide ($ZnIn_2S_4$) marigold like Microsphere are synthesized at 80°C in aqueous solution by using Zinc sulphate $ZnSO_4$, Indium sulphate $In_2(SO_4)_3$ and Thioacetamide C_2H_5NS (TTA). We have characterized the nanopowder of the zinc Indium sulphide, by using various techniques, like UV-Vis spectrophotometer, Field emission scanning electron microscopy (FSEM), X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). The variation of optical properties in Zinc Indium sulphide by using UV-visible spectroscopy, to find the energy band gap (2.31 eV). The hexagonal phase was confirmed from the X-ray diffraction pattern of $ZnIn_2S_4$. We have used a simple route to synthesize the Zinc Indium Sulphide, which involves, no templates, no organic solvents or surfactants, and at low temperature (80 K). Our synthesized Zinc Indium Sulphide have got promising applications in a wide range of areas like solar energy conversion, electrical nanodevices, photocatalysis, optical devices, and electrical devices, etc.

Keywords: $ZnIn_2S_4$; Marigold-like microspheres; Low temperature; XPS.

1063

Investigation of Dielectric Properties and Ferroelectric Phase Transition in Lead-Free AgNbO_3

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Abstract: Dielectric materials based on AgNbO_3 show application capabilities in a broad range of electronics applications. The dielectric and ferroelectric phase transition dominates the temperature and electric field-based performance of AgNbO_3 ceramics which has a major impact on its properties. This study looked into the dielectric and ferroelectric phase transitions of AgNbO_3 . The results of this study suggest that ferroelectric properties occur in AgNbO_3 at temperatures lower than 70°C . At room temperature, XRD characterization of sintered samples for phase investigation showed that AgNbO_3 is orthorhombic. The temperature functions, loss tangent ($\tan \delta$) and dielectric permittivity (ϵ) all displayed performance consistent with a ferroelectric phase transition

Keywords: AgNbO_3 ; Dielectric properties; Ferroelectric; Phase transitions.

1076

Excess Thermodynamic Properties of Binary Liquid Mixture at Different Temperature

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Abstract: With the help of measured values of ultrasonic Velocity (U), density (ρ) and viscosity (η) excess acoustic and thermodynamic properties like velocity (U^E), density (ρ^E), viscosity (η^E), adiabatic compressibility (β_a^E), free length (L_f^E), free volume (V_f^E), acoustic impedance (Z^E), internal pressure (π_i^E), relaxation time (τ^E), Gibb's free energy (G^E) have been calculated for the binary mixture of isopropyl alcohol with CCl_4 , at various temperatures at a fixed frequency of 2MHz for different concentration ranges. The graphs were plotted against the concentration of the mixture at different temperatures, from that the strength and interaction between like and unlike molecules have been discussed

Keywords: Excess parameters; Isopropyl alcohol; molecular interactions.

1067

Studies on Computing Compressive Strength of Zeolite Blended Concrete Using Multiple regression Analysis

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Abstract: Concrete is most extensively adopted materials for construction, due to its high ration of durability to cost. The important factor on which concrete performance depends is characteristics of cement consumed during concrete production. Greater the environmental and economic profits can be achieved when addition of Pozzolanic mineral additives such as fly ash, GGBFS in Concrete production. It is normally accepted that adding of pozzolan decreases the amount of calcium hydroxide in paste of cement and raises the perviousness of concrete.

Zeolites are alumina silicates having crystalline properties with even pores and hollows. They hold exceptional characteristics, such as molecular sieves, ion exchange, a huge area of Surface, and catalytic action, which mark them as anticipated ingredient for numerous industrial uses. The Pozzolanic features of Zeolite are largely due of their volatile content of SiO₂ and Al₂O₃. This content reacts with calcium hydroxide (CaOH₂) which is generated in the procedure the Cement hydration, and transforms it into Calcium silicate hydrate (CSH) gel. Hence, the microstructure of concrete is enhanced and the concrete turn out to be impermeable.

Additives of zeolite concrete implants have been attempted to advertise hazardous substances, especially those contained in car extinguishing. It can be believed that the estimation regarding CO₂ absorption of concrete with added zeolite has not been tested, yet zeolite displays a very good adsorption property for CO₂ and NO_x.

In this study, it is proposed to examine the influence of blending of Natural Zeolite on strength properties of Concrete. Statistical Package for the Social Sciences (SPSS) package is used for multiple regression Analysis to suggest a formulae for strength forecast. The predicted result is validated with the test results conducted in Laboratory on Zeolite blended Concrete.

Keywords: Rigid Pavement; Zeolite; Regression; SPSS; Excel.

1082

Ultrasonic Study of Molecular Interactions in Organic Liquid with CCl₄ at Different Temperature

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Abstract: Acoustic and thermodynamic parameters have been used to indagate the properties of liquids and liquid mixtures. Such studies have been found to provide information regarding the intermolecular processes and the structure of liquid state. The measurement of ultrasonic velocity enables the accurate determination of some useful acoustic and thermodynamic parameters, their excess functions, which are highly sensitive to molecular interactions, thus, provide qualitative information about the physical nature and strength of intermolecular interactions in liquid mixtures. In this present study the ultrasonic velocity, density and viscosity of pure samples such as propane-1-ol, CCl₄ and their mixtures are measured at different temperature 308K, 313K, 318K, 323K and 328K. From these measured values thermoacoustical, thermodynamical and other related parameters have been computed. The results are interpreted interms of molecular interactions present in the mixture, from the variation of thermoacoustic and thermodynamic parameters with mole fraction.

Keywords: velocity; internal pressure; free length; refractive index; thermoacoustic parameters;

2001

Experimental Investigations on the Beta Attenuation Properties of Lead Monoxide – Polycarbonate Composite Films

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Abstract: Lead oxide (PbO) filled polycarbonate (PC) polymer composite films have been prepared with twelve different filler levels (FLs), ranging from 0.5 Wt% up to 10.0 Wt%, by using ultrasonic dispersion of PbO in the PC solution, followed by solution casting method. For these composites, beta radiation shielding properties such as mass attenuation coefficient (μ/ρ), range of beta particles (R) and half value layer (HVL) thickness for beta particles from low activity thallium -204 (²⁰⁴Tl) and yttrium – 90 (⁹⁰Y) radioactive sources have been found theoretically and experimentally, along with the mass density and modified atomic number of the composite material. Two different methods namely, Baltakment's empirical formula method and Bragg's mixture rule have been used to calculate the theoretical values of ($\frac{\mu}{\rho}$), whereas Katz and Penfold relationship has been used to calculate the range (R) of the beta particles obtained from these sources in the prepared composite films.

Keywords: Mass attenuation coefficient; HVL; Range; Composites; Polycarbonate; lead oxide.

2008

Magnetic Susceptibility and Frequency Dependence AC Conductivity of PPY/PANI/V₂O₅ Nanosheets

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Abstract: The conducting copolymer (CCP) Polypyrrole (PPY)/ Polyaniline (PANI) and polycrystalline conducting copolymer nanocomposites (CCPNCs) PPY/PANI/V₂O₅ were synthesized by in situ chemical oxidative polymerization with nano-particles (NPs) V₂O₅ using FeCl₃ as an oxidant and HCl as dopant by keeping different molar weight percent of V₂O₅ with pyrrole and aniline. The chemical structures of prepared PPY, PANI, PPY/PANI, V₂O₅ and CCPNCs are characterized by Fourier transform infrared (FT-IR) spectroscopy and X-ray diffraction (XRD) techniques. Scanning electron microscopy (SEM) were used to characterize the surface morphologies of the PPY, PANI, NPs and the CCPNCs shows some nanosheets having thickness about 28 nm. The grains are highly agglomerated and well interconnected with each other. XRD patterns of the CPNCs shows significant effect of change in weight % of additives V₂O₅ on polycrystalline structure and shows variation in crystallinity. FTIR reveals the broad absorption bands in the range 1100 – 1150 cm⁻¹, which confirms the formation of polymers and absorption bands in the lower frequency regions (750 to 400 cm⁻¹) confirm the existence of MO groups in the hybrids. Magnetic susceptibility increases as increase in magnetic field shows paramagnetic behaviour of CP, CCP and CCPNCs powder at room temperature studied by Gouy's method. A gradual increment in ac conductivity of CP and CCP were observed with increase in frequency and with increase in temperature, revealing its semi-conducting behaviour. CCPNCs pellets also demonstrated a similar trend with increase in conductivity is the effect of different weight % of additive studied by computer control High Resolution Dielectric Analyser.

Keywords: Polypyrrole; Polyaniline; Copolymer; Nanocomposites; ac conductivity; Magnetic susceptibility.

2015

Spectroscopic Studies of Transition Metal Ion-Doped Borate Glasses for Optical Applications

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Abstract: In this work, we report the synthesis and spectroscopic properties of Sodium-Zinc-Borate glasses activated with Cu⁺. The prepared glasses were extensively studied through XRD, UV-Vis-NIR, and Photoluminescence. It is observed that the prepared glasses are amorphous in nature. The excitation spectra for the entire glasses exhibit a strong and broad excitation band in the region of 230-340 nm with a maximum intensity around 260 nm. The emission spectra also consists of a single broad band in the region of 320-650 nm with peak intensity around 460 nm. Since, the Copper has different valance states like Cu, Cu⁺ and Cu²⁺ there will be an ambiguity in assigning the peaks. The glasses were examined through various spectroscopic techniques like Absorption, Tauc's plots and photoluminescence spectroscopy. Red shift in the indirect band gap energy was observed while blue shift in the Urbach energy is observed with Cu incorporation. An overall result suggests the prepared glasses are feasible for luminescence applications.

Keywords: Cu-doped Sodium-Zinc-Borate glasses; UV-Vis-NIR; photoluminescence; color coordinates.

2016

Buckling of Functionally Graded Carbon Nanotube Reinforced Composite Cylindrical Shell Panel with a Cutout under Uniaxial Compression

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Abstract: Under uniaxial compression, the buckling of functionally graded carbon nanotube reinforced composite cylindrical shell panel with a square cutout is investigated. The buckling of functionally graded carbon nanotube reinforced composite cylindrical shell panel is studied through finite element method. The governing equations are derived employing higher order shear deformation theory. A8-noded isoparametric element with 9 degrees of freedom at every node is used. The critical loads for functionally graded carbon nanotube reinforced composite cylindrical shell panel are shown for different volume fractions, different thicknesses, various cutout sizes and five different CNT patterns.

Keywords: carbon nanotubes, buckling analysis; functionally graded materials; cylindrical shell panel; reinforced composite; critical buckling load.

2023

Stability Issues and Mitigating Techniques in the AC Grid System

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Abstract: The AC grid in the present scenario comprises of traditional energy sources and renewable energy sources. The integration of renewable energy sources through the power electronic converters results in instability in the grid. The common power quality issues include poor power factor, reactive power burden, harmonic currents, and unbalanced currents which causes increased losses in the distribution system, noise, vibration, over voltage and excessive current, resonance, de-rating of cables, interference to communication lines, and malfunction of relay and circuit breaker. The paper reviews the various stability issues and mitigating techniques and to find the research gap which require immediate attention for further research.

Keywords: Grid with Multi VSCs; Multi timescale analysis; Impedance Control; Eigen value analysis.

2028

Robustness Evaluation of sub-22nm FinFETs Electrical Characteristics Affected by Physical Variability

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Abstract: The physical parameters of digital devices have been affected by process variability. The paper is focused on subthreshold performance characterization of FET with Visual TCAD (Exploratory Data Analysis) tools considering the FinFET technology. So evaluating the impact of electrical characteristics in the physical variability process with the designers and Visual TCAD tools is a most crucial one. In this paper robustness evaluation of sub-22nm FinFETs electrical characteristics affected by the physical variability process is proposed. The behaviour of a predictive data for FinFET technology, particularly for a NFET and PFET from a 20nm technology to 7nm technology are provided within the ON and OFF currents under the consideration of process variability effects. For a set of FinFET predictive technologies, effects of variations in process parameters on the currents of I_{ON} and I_{OFF} are evaluated in this paper. These evaluations are help in understanding of variability sources that impact on FinFET devices and identifying of significant behavior standards with respect to the use of FinFET devices in digital designs. The results highlight that the I_{OFF} currents are more affected by the impact of geometrical parameters on the FinFET devices than the I_{ON} currents.

Keywords: FinFET (Fin-Shaped Field Effect Transistor), Electrical characteristics, Quantum tunneling, Process Variability;

2025

Enhanced Properties of Zn²⁺ Substituted Cr₂O₃ Nanoparticles in Escalating the Distillate Yield of Acrylic Pyramid Solar Still

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Abstract: Thermal physical analysis of acrylic pyramid solar still coupled with and without Zn²⁺ substituted Cr₂O₃ nanoparticles were had been analysed in this study. Pyramid solar still of area of 0.25m² is designed with an acrylic top cover. Pure and Zn²⁺ doped Cr₂O₃ nanoparticle with different dopant concentrations using the microwave-assisted method is used along with the black absorber paint as an additional source in enhancing the heat transfer in the pyramid still. Heat transfer modes, efficiency (both instantaneous and overall) and thermophysical properties are predicted for pyramid solar still with and without Zn²⁺ substituted Cr₂O₃ nanoparticles.

XRD pattern showed the rhombohedral phase with the average particle size of pure and Zn doped Cr₂O₃ were ±14 nm and ±12 nm respectively. The surface morphology (FESEM) showed nearly spherical shape with loosely agglomerated and the presence of Cr and Zn was confirmed by EDAX analysis. The dielectric measurements showed enhanced dielectric constant and electrical conductivity as the function of temperature at different frequency range.

Performance ratio observed during the study is in the range of 2.11 to 10.125 for the pyramid still performance study, 2.38 to 11.9 % for the pyramid still combined with pure Cr₂O₃ nanomaterial, 2.38 % to 12.87 % for the pyramid still combined with 2.5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial, 2.46 % to 13.22 % for the pyramid still combined with 5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial and 2.54 % to 13.67 % for the pyramid still combined with 7.5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial.

Average daily output of solar still was found to be 2.366 liters/day for pyramid still, 3.147 liters/day for pyramid still combined with pure Cr₂O₃ nanomaterial, 3.299 liters/day for pyramid still combined with 2.5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial, 3.3761 liters/day for pyramid still combined with 5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial and 3.628 liters/day for pyramid still combined with 7.5 mole.% Zn²⁺ doped Cr₂O₃ nanomaterial. Efficiency of the still was calculated as 18.29%, 21.15%, 21.88%, 22.32% and 23.48% for Pyramid still and still with pure Cr₂O₃ and Zn²⁺ doped Cr₂O₃ nanomaterial (2.5 mole.%, 5 mole.% and 7.5 mole.%) respectively. It is found that the productivity yield is increased to higher level due to the higher absorption of solar radiation by the pure Cr₂O₃ and Zn²⁺ doped Cr₂O₃ nanomaterials.

Key words: Solar Still, Temperature, Water Collection, Efficiency, Cr₂O₃ Nanoparticle, Electrical Properties.

2036

Synthesis and Investigation of Structural, Morphological, Thermal Behaviour, and Magnetic Properties of $\text{CoFe}_2\text{O}_4\text{-MnO}_2$ Nano-Composite

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Abstract: In the present work, the nano-composite of $\text{CoFe}_2\text{O}_4\text{-MnO}_2$ has been successfully synthesized by a simple wet chemical route in three steps. Samples were sintered at 800°C for a period of 5 h to get the desired phases. X-ray diffraction studies have confirmed the existence of both CoFe_2O_4 and MnO_2 phases. The average crystallite size was found to be 22.42 nm from the Debye-Scherrer equation. FT-IR analyses confirmed the occurrence of both phases by showing the characteristic band of ferrites at octahedral and tetrahedral sites as well as the vibrational mode of Mn-O. SEM analysis was carried out to study the morphology of the sample, which revealed the rod-like appearance of the composite in a nano-scale. The thermal behaviour of $\text{CoFe}_2\text{O}_4\text{-MnO}_2$ was investigated by using the combined TG-DSC technique, which revealed the endothermic behaviour of the composite. Characterization of magnetic properties was accomplished by vibrating sample magnetometer (VSM). Saturation magnetization, coercivity, retentivity, and squareness were calculated from the hysteresis loop (M-H Curve) obtained from vibrating sample magnetometer (VSM).

Keywords: Nano-rods; Cobalt ferrite; VSM; TG-DSC; SEM.

2043

Effect of Different Electrode Angle as Well as Weld Direction on the Bead Geometry of Submerge Arc Welding Process

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Abstract: Submerge arc welding is the one of most important, high quality and reliable joining technique for heavy industries. In the present study bead-on-plate Submerge arc welding is performed on AISI 1015 mild steel in different welding condition which include electrode angle as well as weld direction. The weldment produce from different parametric conditions are tested in order to measure the bead geometry and quality of the weldment. Optical microscope image of the weld zone reveals that back hand with 45° electrode angle is able to produce high penetration at the weld zone. Whereas, welding performed with 90° electrode angle results in defect free weld zone.

Keywords: Submerge arc welding; Tilt angle; Bead width; Weld penetration; Microstructure; Microhardness.

2066

Synthesis and Characterization of Manganese Doping on NiO Nanoparticles and its Supercapacitor Applications

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Abstract: In this study, bare nickel oxide (NiO) and Mn²⁺ doped NiO nanoparticles (NPs) were prepared through precipitation method. Samples were analyzed by XRD (X-ray diffraction), FT-IR (Fourier-transform infrared spectra), SEM (scanning electron microscope), EDX (energy dispersive X-ray analysis), and CV (cyclic voltammetry) techniques. The XRD result indicates that the obtained samples of bare and doped NiO NPs shows a face-centred cubic structure. SEM images established that the bare NiO NPs and Mn²⁺ doped NiO have a spherical shape. The formation of the NiO phase was confirmed by the existence of a peak at 436 cm⁻¹ in FTIR. Electrochemical properties of bare and Mn²⁺ doped NiO NPs was investigated regarding its performance as electrode in super capacitors. The highest specific capacitance shows on bare NiO electrode 555 Fg-1 at 10mVs⁻¹ scan rate. it shows that is a good electrode material for super capacitor.

Keywords: Precipitation method; X-ray technique; Electrochemical capacitance.

2077

Emission Control Exploring the Energy and Exergy Analysis for Turbines of a 500MW Coal-Based Conventional Power Plant

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Abstract: This work considers an analysis using energy and exergy of turbines for a coal-based conventional steam power plant of 500MW under the Damodar Valley Corporation (DVC), India to optimize its operating conditions. A deal has also been incorporated to control the environmental emission of different gases from the plant. Hence, a control volume is assumed consisting of a high-pressure turbine (HPT), an intermediate turbine (IPT), and a low-pressure turbine (LPT) of the plant. A thermodynamic-based model is considered in determining the performance of turbines in the power cycle under various unit loads (60%, 80%, and 100%). This analysis includes a prediction of energy, then exergy, and related irreversibility of flow stream to and from said control volume under the unit load conditions. The improvement in heat rate of the turbine with an increase in load is also estimated. As found, the heat rate reaches a minimum when the plant operates at higher unit loads (80% and 100%), which is an economical condition of operation. With the basis of the improved heat rate, a reduction in coal consumption, plant ash generation, also SO₂ and CO₂ emissions by the plant are estimated.

Keywords: Steam Power Plant; Turbines; energy and exergy analysis; irreversibility; emissions.

2080

RF-sputtered V_2O_5 Thin Films on Two Different Glass Substrates

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Abstract: Thin V_2O_5 films were deposited on two different commercial soda-lime glass substrates (A and B) by O_2 reactive radio frequency magnetron sputtering using a vanadium target. The influences of the surface energy and roughness of the substrates on the structure and atomic bonding of the films were examined. The film on substrate A was polycrystalline, with eight crystal orientations, whereas the film on substrate B yielded an intense (001) diffraction peak of α - V_2O_5 and a weak (200) peak of β - V_2O_5 , indicating preferred orientation along these planes. Structural analyses indicated that substrate B with lower surface energy and higher roughness enhanced the formation of a layered α - V_2O_5 structure..

Keywords: Vanadium pentoxide; 3D surface topography; surface energy; X-ray diffraction; Raman spectroscopy

2086

Hydroelastic Analysis of Floating Long Viscoelastic Plate in Shallow Water

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Abstract: The present study investigates the interaction of gravity waves heading on a large viscoelastic floating structure of negligible draft in shallow water region. The flexible property of the plate is modeled using well known Euler-Bernoulli beam equation, whereas the viscosity is modeled using complex flexural rigidity parameter. The problem is solved using the eigenfunction expansion procedure. Due to the presence of complex flexural rigidity, the dispersion relation in the region covered by the plate is complex in nature, and therefore the roots of the dispersion relation are complex types. The location of the roots has been found using Matrix analysis. Finally, various results of physical interests are studied for a wide range of structural and wave parameters.

Keywords: Shallow water; Viscoelasticity; Eigenfunction expansion; Dispersion equation; Reflection and Transmission coefficients.

2088

Investigation of DFT on the Structural and Electronic Properties of Silicene Nanoribbons when Adsorption of Li, H, Fe

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Abstract: The adsorption of Li, H, and Fe atoms on silicene nanoribbons is studied with density functional theory. In this paper, we have optimized the structure of silicene nanoribbons upon adsorption of Li, H, Fe atoms and investigated the bandgap widths of each adsorption system. Then, the electronic properties of the adsorption system are calculated. Our results show that the bandgap expands when adsorption of H gas atom and narrows when Li, Fe gas adsorption. The adsorption of Li and Fe atoms changes pure silicene nanoribbons to show metallic properties and semiconductivity when adsorption of gas atoms. These results open new research directions for new materials for electronic devices.

Keywords: silicene; nanoribbons; adsorption; density functional theory.

2095

Effect of Sawdust Addition on the Mechanical and Water Absorption Properties of Banana-Sisal/Epoxy Natural Fiber Composites

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Abstract: In this work, the hybrid natural fiber composites (NFCs) were prepared using a standard hand lay-up technique from Banana fiber (B), Sisal fiber (S), and sawdust (SD) with different compositions viz. S-I (B 60%–S 20%–SD 20%), S-II (B 80%–S 5%–SD 15%) and, S-III (B 80%–S 15%–SD 5%) bounded with 80% epoxy resin LY556 and hardener LY953 in the 4:1 ratio as per ASTM standards. All the specimens were made with proper composition of 20 wt.% of reinforcing materials and 80 wt.% of the matrix material. The mechanical (tensile strength, compressive strength, flexural strength, and impact strength) properties and Brinell hardness of prepared specimens were conducted according to ASTM standards. The tensile, compressive, flexural, and impact strength, as well as Brinell hardness of the prepared NFCs, were found to increase with the increase in sawdust content in the epoxy matrix. Further, an improvement in the water absorption property was registered with the increment of sawdust content in the banana-sisal/epoxy composite. The improved mechanical, as well as water absorption properties and better Brinell hardness, foreshadow the industrial promises of the present NFCs a better alternative for synthetic fiber-reinforced composite materials.

Keywords: Banana fiber;Sisal fiber; Saw dust; Epoxy resin; Mechanical properties.

2093

Effect of Water Pressure and Temperature on Spherical Float of Level Sensing Auto Drain Valve

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Abstract: A float detects the level of a liquid in a tank or a container. It floats on top of the liquid surface and acts as a mechanical switch when the water moves up or down in the auto drain valve tank. The auto drain valve removes the water in the compressed air circuit. The spherical float used in the auto drain valve is prone to the realization of a dent and the float joint fails due to the high pressure of air in the compressed air circuit. In this paper, the spherical float was analysed numerically to select the suitable stainless steel materials out of SS 302, SS 305, SS 312, SS 316 to withstand the high-pressure force and temperature of the air in the drain valve. The applied pressure was varied from 0.7 to 2.0 MPa and the temperature from 2°C to 80°C based on the drain valve application. The structural analysis results obtained were the total deformation, the equivalent stress, and the pressure at the joints of the float. Equations were obtained to get the relationships between applied pressure and temperature with equivalent stress and total deformation. The results indicate that both equivalent stress and total deformation varies linearly with pressure. With respect to temperature, equivalent stress varies linearly and total deformation varies in polynomial relation. The minimum and maximum values of total deformation obtained were 0 to 0.0132 mm, equivalent stress were 37.11 to 75.40MPa and the average joint pressure was 12.43 to 76.56MPa. The results show that SS 314 grade could be chosen for fabrication of spherical float in drain valve application.

Keywords: Structural analysis; spherical float; level sensing drain valve; deformation; equivalent stress; joint pressure

3015

CFD Study on the Effect of Nanofluids in Natural Circulation Loop with a Side Heater

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Abstract: A Natural circulation loop (NCL) consisting of a heater in the side leg and a heat exchanger at the top end for heating and cooling the working fluid. The performance of natural circulation loop is investigated with water, nanofluids of Alumina and CuO of 0.5%, 1% and 1.5% (by weight) concentration. The behaviour of the loop for various heat inputs at the heat source is investigated with water and then for Alumina and CuO nanofluid as loop fluids.

It is found that the performance of the loop is high when the working fluid used is copper oxide nanofluid compared to alumina nanofluid and water. The mass flow rate is highest for 1.5% CuO nanofluid which is 4.58 g/s. Heat transfer Coefficient of the loop fluid at the heat source increases with an increase in the heat input to the heat source. It stands highest in the case of 1.5% CuO which is 734.84 W/m²K at 175 W of heat supply, which is incomparable to any other loop fluid considered for the present study. It is found that the heat transfer coefficient for water as the loop fluid is lesser than compared to nanofluids as the loop fluid. In comparison to 1.5% CuO nanofluid it is seen that the heat transfer coefficient of water is only 601.33 W/m²K at 175 W of heat supply. There is also a significant difference for heat transfer coefficients of water and the nanofluids of CuO and alumina in the natural circulation loop for various amounts of heat supplied in the heat source

Keywords: natural circulation loop, heat source, cold end heat exchanger, nanofluid;

3016

Optimum Utilization of Ceramic Tile Waste for Enhancing Concrete Properties

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Abstract: Use of ceramic products (tiles, electrical insulator, sanitary fitting etc.) in building and structural construction are increasing day by day. Generation of ceramic waste is increased globally due to fragile nature of ceramic it easily breaks during processing, transportation and installation. Therefore, researchers are growing interest in using ceramic waste as alternative aggregate materials for construction. While other ceramic product wastes such as sanitary wares and electrical insulators have been extensively investigated, not much findings are available on ceramic wall and floor tiles wastes. Thus, the current study focuses on the mechanical (compression, tensile, flexural and abrasion) and permeability characterization of waste ceramic wall and floor tiles aggregate concrete. Ceramic tiles were used as crushed coarse aggregate in concrete as a replacement for natural aggregates by the replacement level of 0%, 5%, 10%, 15% 20% and 25%. From the results it has been observed that ceramic waste enhances the performance of concrete at certain level of replacement. Ceramic waste has potential to use in concrete structure at certain level of replacement to achieve desirable properties.

Keywords: Ceramic tiles waste, Mechanical properties, permeability, abrasion depth, waste concrete;

3024

UV-Vis Absorption Spectroscopic Analysis of Er^{3+} ion doped Oxyhalide Glasses

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Abstract: The glass networks are exciting with a result of their bonding like bridging and non-bridging over oxygens ions. In these networks the B_2O_3 and Li_2O glass network is added with Bi^{3+} and Er^{3+} ions. we calculated some optical properties of oxyhalide glass system $60B_2O_3 + 30 Li_2O + x Er_2O_3 + (10 - x) BiCl_3$. with x changing from 0.1 – 0.5 mol % utilizing UV-Vis absorption spectra and the band gap was calculated utilizing Tauc plot relation. In these networks carry out direct and indirect permitted optical band gap energies (E_g). These outcomes show that, E_g decreases with the addition of Er^{3+} ions oxyhalide glasses content. Several proposed relationships for the refractive index and band gap energy for various compositions are discussed. Utilizing distinctive theoretical models, a suitable relationship is identified for the composition studied in this work.

Keywords: Energy gap, Refractive index, Borate glass, Diborate glass and Oxide ion;

3026

Multiple Slips and Heat Source Effects on MHD Stagnation Point Flow of Casson Fluid Over a Stretching Sheet in the Presence of Chemical Reaction

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Abstract: The numerical analysis of the steady MHD stagnation point flow of a Casson fluid flow over a stretching sheet in the presence of a heat source and the first-order chemical reaction with multiple slip boundary conditions taking into account viscous dissipation, Joule warming, and the first-order chemical response with multiple slip boundary conditions is performed. The governing flow equations are interpreted with the assistance of identity transmutations, and the condensed nonlinear coupled ordinary differential equalisations are determined applying the shooting approach. With the use of graphs, the impacts of several factors on the dimensionless velocity, temperature, and concentration profiles are demonstrated. In addition, graphical representations of the variation in skin friction coefficient for different values of the Casson fluid parameter against the Eckert number, the variation in the rate of heat transfer coefficients for various values of the Radiation specification against the Schmidt number, and the variation in the rate of mass transfer for different values of the chemical reaction specification against the Schmidt number are provided.

Keywords: Magneto hydrodynamics, Casson fluid, Stagnation point flow, Heat source, Chemical reaction, Multiple slips, Joules heating.

3029

Combined Effect of Metakaolin and Hybrid Fibers on the Strength Properties of High Performance Concrete

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Abstract: This study aims to investigate the combined effects of Metakaolin (MK) and Hybrid fibers on High-Performance Concrete's (HPC) mechanical properties. A constant proportion of 0.25% for polypropylene fibers (PF) and varying proportions of 0%, 0.5%, 0.75% and 1.0% for steel fibers (SF) making a total fiber volume fractions of 0%, 0.75%, 1.0% and 1.25% were used to develop hybrid fiber-reinforced high-performance concrete (HFRHPC). Four replacement levels for hybrid fibers by volume of the binders and four partial replacement levels for metakaolin (0%, 10%, 20% & 30%) by weight of cement have been considered for three different water binder ratios (0.275, 0.325 & 0.375). An aggregate binder ratio of 1.75 was kept constant. The test results reveal a maximum increase of 31.83%, 37.05%, and 36.53% in compressive strength for curing periods of 7, 28, and 56 days, respectively. The split tensile strength, flexural strength, and impact strength test results show an increase of 42%, 74.41%, and 68.32% for a curing period of 28 days. Additionally, linear regression analysis was performed, and plots of compressive strength v/s tensile strength and compressive strength v/s flexural strength have been obtained to develop a relationship between compressive strength, tensile strength, and flexural strength. With the incorporation of metakaolin and hybrid fibers into the concrete matrix, very high mechanical properties could be achieved. The results indicate that a combination of 1.25% hybrid fibers and 10% Metakaolin gains all the water-binder ratios' highest strength.

Keywords: Compressive Strength, Flexural Strength, High-Performance Concrete, Hybrid Fiber, Flexural Strength, Impact Strength.

3037

Characteristics of MHD Casson Fluid past an Inclined Vertical Porous Plate

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Abstract: In a study of the thermal diffusion and chemical reaction of MHD Casson fluid flow past an inclined vertical porous plate in the magnetic field, the thermal diffusion and chemical reaction are tested. The governing equations are linear and combined in dimensionless form. The equations in these problems are solved by using perturbation techniques. The findings are shown in a table and graphically for different single control parameter values. Our illustration shows that the induced magnetic field is thought to be downward intensifying as the parameter moved closer to the implantation. The temperature profile is accelerated by heating the reaction at a later point in time. Also, the concentration spread is decelerated by increasing the chemical reaction.

Keywords: Magnetic Field, Casson Fluid, Slip Flow Regime, Thermal Diffusion and Chemical Reaction;

3043

Free Vibrations of Rigidly Fixed Electro-Magneto Non-Local Generalized Thermoelastic Cylinder with Voids Material

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Abstract: Herein, the study of present paper concentrates on the vibrations of rigidly fixed electro-magneto nonlocal elastic voids cylinder with generalized thermoelasticity. The surfaces of nonlocal elastic hollow cylinder have been assumed isothermal/thermally insulated and rigidly fixed. For the investigation of the vibrations of rigidly fixed boundaries, we make use of numerical Iteration method using MATLAB tool. The real parts of generated data have been considered natural frequencies as shown in table. Numerical computations in local/nonlocal elastic materials for free vibration field functions have been displayed graphically.

Keywords: Nonlocal elasticity; Electro-Magnetic field; Voids material; Thermoelastic damping; Frequency shift; Lord-Shulman model.

3046

Bending Response Optimization of an Ionic Polymer-Metal Composite Actuator Using Orthogonal Array Method

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Abstract: In the recent past decades, Ionic polymer-metal composites (IPMCs) have been researched in detail due to their flexible characteristics and light in weight. IPMC is most well-known electro-active polymers (EAPs), which can be used in the medical applications, biomimetic, micro robotic actuators, artificial muscles, dynamic sensors and underwater propulsions. Due to their large bending actuation with low voltage sources and biocompatibility, IPMCs are receiving more and more attention to many researchers in recent days. To reduce the experimental costs, the principal factors which are responsible for more bending response are designed in this work using Taguchi orthogonal array method. Multiple process parameters include input voltage and thickness of the fabricated Ag-IPMC actuator was optimized to produce a maximum bending response. Experiments were carried out using L9 orthogonal array to recognize the optimal process parameters. In the optimized conditions, the IPMC actuator exhibited a noteworthy improvement in bending deflection compared to the normal conditions. Under the application of 1.0V, the bending response increases around 30% in the optimised condition compared to normal IPMC actuator. This study lays a solid foundation for developing high performance IPMC actuator where higher bending displacement is required i.e., in the robotic and biomimetic application with a very small input voltage.

Keywords: IPMC; Actuator; Optimization; Orthogonal Array; Bending Response.

3047

Thiourea doped TiO₂: Structural, Optical and Electrochemical Properties

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Abstract: Pure and thiourea doped TiO₂ nanoparticles were synthesized using sol gel route and characterised for its structural, optical and electrochemical properties. Structural characterization were performed by powder X-ray diffraction measurements which confirmed formation of double phase, anatase and brookite phase with particle size of ~ 10 nm. The optical absorbance of the pure and doped TiO₂ have been measured in the visible and NIR region and band gap energy obtained lies in the range of 3.0 -2.65 eV. The carrier concentration calculated by Mott Schottky exhibits an increase on doping TiO₂ with thiourea. This work suggests that the doped TiO₂ could be used as promising materials for use as photocatalyst, optoelectronics and photoanode in dye sensitized solar cells due to its higher absorption and high carrier concentration.

Keywords: TiO₂; X-ray diffraction; UV-visible spectroscopy; Mott Schottky; electrochemical.

3051

Angular Dependence of Localized Mode of Chalcogenide Photonic Crystal

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Abstract: In this paper, we have designed a one-dimensional chalcogenide photonic crystal using As₂Se₃/air multilayered structure. A single defect is introduced by replacing As₂Se₃ layer with As₂S₃. In the proposed structure, the well-known transfer matrix method is employed to determine the transmission spectra for both TE (transverse Electric) and TM (transverse Magnetic) modes. A theoretical analysis of effect of incidence angle on defect modes is presented. Variation in incidence angle causes the shift in defect modes.

Keywords: Photonic crystal; Chalcogenide; TMM; Defects etc.

3061

Experimental Investigations of Wire Lag Phenomena on Wire Electrical Discharge Machining of M2 Tool Steel

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Abstract: A detailed experimental research study on wire lag phenomena, gap force, and wire lag compensation has been carried out on M2 tool steel material to overcome the error in dimensional accuracy for circular or curved profile job cutting in the wire electrical discharge machining. The design of experimental planning was made based on Taguchi methodology to determine the effect of the WEDM input control parameters on the wire lag related to different machining criteria, as well as the material removal rate, surface finish characteristic in terms of Ra values, spark gap, and specific energy consumption in this research work. The frequency, pulse on time, peak current, wire feed, workpiece height and wire tension, cutting diameter, and the span in between wire guide and job surface are considered as input control parameters for the present study. Parametric analysis shows that wire lag increases with workpiece height and wire lag compensation value increase rapidly with the decrease of job diameter. Parametric analysis is also carried out for MRR, surface roughness, spark gap, and specific energy consumption for optimum output. A further key finding is identified that the energy utilization efficiently increases with larger height job cutting in the WEDM process.

Keywords: Gap force; Wire lag; Wire lag compensation; MRR; Specific Energy Consumption.

3068

Influence of Cu²⁺ Substitution on Structural and Optical Properties of Mg-Zn Ferrite Nanoparticles

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Abstract: The Cu²⁺ doped Cu_xMg_{0.5}Zn_{0.5-x}Fe₂O₄[x= 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5] ferrite nanoparticles were synthesized by co-precipitation method using oxalate precipitant. The synthesized oxalate precursors have been characterized by Elemental analysis, FT-IR and Thermogravimetry. The structural and optical properties of final ferrite samples have been investigated by X-ray diffraction (XRD), Fourier Transform Infra-Red spectroscopy (FT-IR) and UV-Vis Diffuse Reflectance Spectroscopy. The XRD patterns reveals no additional peaks due to second phase i.e. single phase cubic Cu-Mg-Zn ferrites nanoparticles are formed. The parameters like theoretical and experimental lattice constant, crystallite size, X-ray density and unit cell volume extracted from XRD data. It is noticed that with increasing Cu²⁺ doping lattice parameter and unit cell volume are decreased while X-ray densities are increased. The interionic distances like ionic radii, bond lengths, hopping lengths and anion-anion distance were also evaluated. FT-IR spectra exhibit two distinct absorption bands in the range of 568 to 589 cm⁻¹ and 448 to 461 cm⁻¹ which are characteristic of ferrite. Different force constants and Debye temperature for synthesized samples found in agreement with literature. The absorption spectra and Energy band gaps are evaluated by using UV-Vis DRS. The energy band gaps Cu-Mg-Zn ferrites found in the range of 1.643 eV to 1.557 eV. UV-Vis DRS analysis showed that the band gap energy decreases with increasing Cu²⁺ doping.

Keywords: Cu doped Mg-Zn ferrites, Co-precipitation, XRD, FT-IR, UV-Vis DRS.

3069

Effect of CNT Content on Microstructure and Hardness of AlSi/MWCNT Nano Composite

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Abstract: The utilization of aluminum alloy grows rapidly in automobile and aerospace industries due to its low weight to high strength. Going a step further, with the process of reinforcing MWCNT (multi walled carbon nanotubes) gives better properties with an observable decrease in its overall weight.

In the present investigation, increasing of CNT wt% with ball milling time on hardness and micro structure of metal matrix composite is studied. multi wall carbon nanotubes are mixed uniformly with Aluminum silicon alloy powder in the weight percentage of 0,0.25,0.50 & 0.75 using high energy ball milling process. Followed by compaction to prepare a specimen size of 20mm diameter and 20mm length. sintering and extrusion process combined to utilize the heat of sintering and thus gives the final specimen with size of 8mm diameter and 60mm length..

Finally, the Micro structural analysis (XRD, SEM WITH EDAX and OM) are performed for each composition which was followed by Vickers hardness test.

Keywords: AlSi; MWCNT; CNT; HEBM; Automobile.

3095

Mathematical Modeling of Various Forces Acting on Piston Rod Packing Rings

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Abstract: Piston rod packing, a critical part of compressor provides dynamic sealing surrounding the piston rod. Typically, casings with one or more rings in each, are bolted to the cylinder head for providing effective sealing. Generally, the packing rings are subjected to cyclic loads under high pressure and high-speed operating conditions. Packing rings are usually subjected to pressure equal to the pressure in compressor chamber. Failure of the packing to operate satisfactorily can result in plant downtime which eventually may affect the output. Hence, packing rings need to be critically designed. In this paper an attempt is made to develop a mathematical model for critically designing packing rings with variable crank angle. The developed mathematical model can be effectively used for predicting compressor reliability and cost-effectiveness.

Keywords: Piston rod packing; Packing ring; Compressor sealing; Mechanical packing; Pressure packing.

3096

Investigation of Structural and Electrical Properties of Nickel Chloride Doped Pyrrole Aniline Copolymer

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Abstract: Chemical oxidative copolymerization has been employed for the synthesis of pyrrole and aniline copolymer at room temperature, in equal proportion. The prepared copolymer was undoped and then further doped with 10% NiCl₂ using immersion method. Structural characterization of self-doped, undoped and doped copolymer was performed using FTIR, WAXD and SEM techniques. Results reveal the modifications in the original copolymer structure accompanied by various shifts in the band positions and appearance of the new bands in IR spectrum due to doping. The X-ray diffractograms reveals presence of modified and shifted peaks indicating the changes due to doping. The scanning electron micrographs of undoped and doped copolymers show globular structure due to doping when compared with that of the parent copolymer. In addition, using two probe methods the dc electrical conductivity of these samples was recorded in the temperature range of 313K to 673 K, at a field of 27 V/cm. The log σ Versus 1/T plots of the self-doped and doped samples display the transformation of the sample at a given temperature from metallic to semi conducting and vice versa. The I-V plots for the self-doped and doped copolymer has also been plotted at a fixed temperature of 323K which shows linear behavior of the samples. The conductivity measurements show reduction in conductivity of prepared samples thereby suggesting the presence of bipolarons as charge carrier. The results confirm the effect of doping on the copolymer properties.

Keywords: Pyrrole; aniline; copolymer; FTIR; SEM;

4004

Synthesis Characterization DC Conductivity and EMI Shielding Studies of Iron-Decorated Polypyrrole-Fly Ash Nanocomposites

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Abstract: Iron decorated Polypyrrole-Fly ash nanocomposites are obtained in aqueous medium using green tea extract and aqueous ferric chloride. During the synthesis process, iron (Fe) gets uniformly decorated on to the surface of Ppy-fly ash nano composites. The morphology, structural characteristics were confirmed by various spectroscopic methods like X-ray Diffraction (XRD), Scanning Electronic Microscopy (SEM), FTIR, Tunnelling Electron Microscopy (TEM) etc. As obtained Fe-Ppy-fly ash nanocomposites were used for EMI shielding, conductivity measurements which can be explored for various attractive applications such as sensors, batteries, EMI shielding, and other electronic devices.

Keywords: Polypyrrole; Nano composites; EMI Shielding; conducting polymer.

4006

Arriving the Suitability of Polyethylene Wastes in Flexible Pavements: An Experimental Approach

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Abstract: The disposal of non-biodegradable materials like polyethylene, tetrapak etc have been a severe threat to the surrounding environment especially in developing/ under developing countries. Out of that, the polyethylene materials are commonly used to pack food and essential commodities like milk, curd, ghee, oil, snacks etc. After usage of these products, the polyethylene packs are left as solid wastes which was disposed either incineration or by dumping as landfills. An effort to find useful application of those polyethylene material wastes is on one side. In other side the existing pavements are not able to withstand the increase in traffic loads and thereby results to premature failure causing various pavement distress. In these aspects, to explore new suitable and sustainable alternative bituminous mix is a demanding need. In order to address both these issues, the present study investigated the suitability of polyethylene wastes in to the bitumen concrete mix. For this study, the polyethylene wastes of milk packets are shredded to a varying length of 1.5 cm, 3 cm, and 6 cm are mixed in dry pieces with the heated aggregates at temperature of 150- 170°C. Marshall specimen of bituminous concrete with and without shredded polyethylene wastes are prepared and tested as per the standard procedure. The Marshall characteristics like Marshall Stability, flow value, unit weight, air voids etc are determined. Based on the performance evaluation, all the Marshall characteristics of the mix are found to be satisfied for the utilization of shredded polyethylene waste strip 3.0 cm at 0.5% by weight of aggregate for both bitumen content 5% and 6%.

Keywords: Polyethylene wastes; Pavements; Bituminous mix; Marshall Stability; Voids; Flow value.

4014

Study of Structural and Electrochemical Properties of Ilmenite (FeTiO₃) doped TiO₂

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Abstract: Ilmenite (FeTiO₃) is an attractive semiconducting compound with a wide bandgap that enables its application in spintronics, photocatalysts, optoelectronics, chemical catalysts and high temperature integrated circuits etc. In the present study we have synthesized a FeTiO₃ doped TiO₂ composite of molar concentration 25:75 by facile sol gel process and investigated the structural and electrochemical properties. XRD confirms that the 75TiO₂-25FeTiO₃ composite is a mixture of the anatase TiO₂ phase and the rhombohedral FeTiO₃ without the presence of any impurity phases. The electrochemical behavior of the FeTiO₃ doped TiO₂ electrode was characterized by Cyclic Voltammetry and Mott Schottky. On studying the Mott-Schottky curve the donor density and flat band potential for the sample is calculated. Using the combined result of our experimental study, we can expect an enhanced results and photocatalytic properties using the 75TiO₂-25FeTiO₃ composite sample on application in optoelectronics and photocatalytic devices.

Keywords: FeTiO₃ doped TiO₂; Cyclic Voltammetry; Mott-Schottky Analysis; Structural property; Photocatalyst

4018

Low Temperature Synthesis and Influence of Ce³⁺ Substitution on Structural and Magnetic Properties of Nanocrystalline Cobalt Ferrite Using Citrate Precursor Sol-Gel Method

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Abstract: Rare earth element Ce³⁺ substituted spinel cobalt ferrite, CoFe_{2-x}Ce_xO₄ for (x=0.0, 0.05, 0.10, 0.15, 0.20) is synthesized using an economical sol-gel technique. The X-ray diffraction analysis reveals that all samples have spinel symmetry indexed to *Fd3m* space group. Fullprof Rietveld analysis is performed to find out lattice parameters that increase monotonically due to induced lattice strains in samples. The crystallite size was determined to be 54.9 nm using Williamson-Hall plots. The morphological analysis of samples has been performed using SEM imaging. FTIR spectrum confirms octahedral and tetrahedral site occupancy by metal-oxygen bonds for all samples. The magnetic properties of samples refine with Ce³⁺ doping at iron site, with magnetization ranging from 23.59 to 57.68 emu/g and retentivity 17.14 to 24.08 emu/g. The Coercive field values drastically increased from 739 to 1912 Gauss. Thus, we have explored the influence of rare earth Ce³⁺ (1.14 Å) substitution at the Fe³⁺ site (0.55 Å) in CoFe₂O₄ crystal lattice for improvement of its structural and magnetic properties in this paper.

Keywords: Spinel ferrite; Coercivity; Sol-gel; Ferrimagnetic; Magnetization.

4025

Parametric Amplification of Acoustical Phonons in Semiconductor Magneto-Plasmas: Quantum Effects

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Abstract: Using QHD model, the quantum effects (QEs) on parametric amplification of acoustical phonons in semiconductor magneto-plasmas have been investigated. Assuming that the origin of nonlinear interaction lies in nonlinear induced current density of the medium (arising due to density perturbations of the medium) in the presence of pump field, expressions have been obtained for second-order susceptibility of the medium and hence the threshold pump amplitudes (with and without QEs) and as well as parametric gain coefficients (with and without QEs). Numerical analysis has been made for n-InSb-CO₂ laser system. The dependence of these parameters on acoustic wave number, external magnetic field, and doping concentration has been explored. It has been found that the Bohm potential in the electron dynamics reduces the threshold pump amplitude for the onset of parametric amplification four times whereas enhances the parametric gain coefficient approximately fourteen times. The analysis provides the detailed information of quantum effects semiconductor magneto-plasmas and establishes the technological potentiality of semiconductor magneto-plasmas as the hosts for fabrication of efficient parametric amplifiers.

Keywords: Laser-plasma interaction, parametric amplification, quantum effect, semiconductor plasma.

4046

Numerical Study of Fluid Flow and Heat Transfer for Flow of Cu-Al₂O₃-Water Hybrid Nanofluid in a Microchannel Heat Sink

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Abstract: The use of micro-electronic devices in many applications such as aerospace, telecommunications, micro-electronics, robotics is drastically increasing and they need efficient cooling system. Micro-channel heat sinks (MCHS) are getting significant importance due to their very high surface to volume ratio and high heat dissipation rate. The hybrid nanofluids playing a vital role as cooling fluids in various thermal transportation applications due to their extraordinary heat transport characteristics. A numerical study is taken up for laminar flow of hybrid nanofluid as a heat transport medium in a rectangular MCHS to realize thermal and hydrodynamic behaviour in forced convection. The influence of Reynolds number (Re) and volume concentration of nanoparticles in Cu-Al₂O₃/water hybrid nanofluid on MCHS performance is investigated in the present paper. The correlations presented in the literature are used to calculate the properties of hybrid nanofluids. For various mixture ratios of 25%-75%, 50%-50% and 75%-25% hybrid nanofluids the heat transport rate and pressure drop are calculated at different Reynolds numbers and compared with mono nanofluids of Cu-water (H₂O) and Al₂O₃-water. An enhancement in heat transfer rate is observed with raise in volume fraction and marginal increase in pressure drop is observed for hybrid nanofluids over mono nanofluids of Cu-water and Al₂O₃-water. The results indicate an increase of 13.2% and 23.07% in Nusselt number for Cu-Al₂O₃/water hybrid nanofluid compared with Cu/water and Al₂O₃/water mono nanofluids respectively at 2.5% volume fraction. It is found from the numerical results that the pumping power requirement is less for hybrid Cu-Al₂O₃/water nanofluid compared to Cu/water nanofluids and an increase of 430 Pa compared to pure water. The data existing for Al₂O₃-water nanofluid in the literature is used to validate the present model.

Keywords: MCHS; Hybrid nanofluid; Cu-Al₂O₃ -water Nanofluid; Laminar flow; Pressure drop.

4082

In Vitro Study of Green Synthesized ZnO Nanoparticles on Human Lung Cancer Cell Lines

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Abstract: This paper presents green synthesis of ZnO nanoparticle (L1-NPs) using extract of leaves of *Azadirachta indica* (Neem tree). Characterizations of synthesized L1-NPs have been done by UV-Visible spectroscopy, FTIR, powder x-ray diffraction (PXRD), Scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), field emission scanning electron microscopy (FE-SEM). The effect of synthesized nanoparticles on viability of human lung adenocarcinoma (A549 cells) have been determined using MTT assay. The viability of A549 cells have been significantly decreased by ZnO NPs synthesized with leaves extract as well as only extract (OE) of leaves of *Azadirachta indica* (Neem tree) in a dose-dependent manner. In addition, we have observed that the cell viability could be significantly reduced with an incubation period of 48 h at 100, 150, 200 and 250 µg/mL. The IC₅₀ value for zinc oxide nanoparticles prepared with 1 mL of leaves extract (L1-NPs) has been obtained 138.50 µg/ml after 48h incubation.

Keywords: ZnO NPs; Green synthesis, A549 cells, MTT assay, *Azadirachta indica*, Only extract (OE), Cell viability.

1002

Recycling and Reclamation of MSW Using MRF Techniques in Madurai

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Abstract: The expanding level of solid waste is these days, a significant issue in urban and rustic territories. A high rate of development of the population and expanding per-capita pay have brought about the age of tremendous strong waste representing a genuine risk to the ecological quality and human wellbeing. Ill-advised transfer of waste regularly brings about the spread of maladies and sullyng of water bodies and soils. The effects of these losses on the economy can't be overlooked and overseeing them has turned into a noteworthy issue. Along these, the main arrangement of diminishing the above impacts of solid waste administration is to decrease the solid waste generation (by reducing the raw material production and reclamation of recyclable products). This paper identifies the need for embracing the MRF (material reclamation facilities) systems of reusing and recovery of strong waste which are gathered in the Madurai area in the Tamil Nadu state. This technique for recovery of recyclable squanders helps in the decrease in crude material creation and monetarily profitable. Different qualities of the waste gathered from the ideal region were broke down and the segments of the waste isolating hardware were structured.

Keywords: Municipal Solid waste management; Recycling; Material Recovery Facilities.

1075

Exploring Potential of Glass Surface Immobilized Short Antimicrobial Peptide (AMP) as Antibacterial Coatings

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Abstract: Bacterial infections associated with biomedical devices and implants pose serious clinical threat to human health and medical sector. Antimicrobial peptides (AMPs) based coatings are promising candidate to prevent these infections due to broad spectrum antimicrobial activity, reduced bacterial resistance propensity, and low cytotoxicity. In this study, an *in-house* designed peptide, KLR (KLLLRRLRKLRR), is immobilized onto glass substrates and its antibacterial activity against *E.coli* and *S.aureus* is studied. The effect of orientation of the peptide on the antibacterial activity is also tested by tethering the peptide through its C-terminus, using EDC/NHS coupling, and N-terminus, using maleimide-thiol chemical coupling. To confirm successful modification in all the sequential steps, X-ray photoelectron spectroscopy (XPS), water contact angle (WCA) measurements, and atomic force microscopy (AFM) is used. Antibacterial assays reveal that peptide-modified surfaces exhibit excellent antibacterial activity against *E.coli* (Gram-negative bacteria) but were ineffective in inhibiting *S.aureus* (Gram-positive bacteria). Furthermore, confocal studies with dye encapsulated giant unilamellar vesicles (GUVs) show that immobilized KLR induces dye leakage from the vesicles indicating pore-forming action mechanism of immobilized peptide. These peptide coated surfaces exhibit no cytotoxicity towards mammalian cells. Thus, these short peptides can be synthesized easily and cost effectively, opening an opportunity to be new antibacterial surface coating agents.

Keywords: Glass; Antimicrobial peptide; Antibacterial coating; Immobilization; EDC/NHS coupling; Maleimide-thiol coupling.

1094

AHSS Welding using undermatching Filler Wires and Process Advantages with P-GMAW

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Abstract: The major challenge during welding of advanced high strength steels (AHSS) is finding an appropriate low cost filler wire which minimizes the softening in the heat affected zone (HAZ). The fabricators always prefer undermatching wires to join the thinner sections. This study reports the differences in the microstructure and mechanical properties of Ti-Nb microalloyed steel prior welded using pulse gas metal arc welding (P-GMAW) and standard gas metal arc welding (GMAW). The results indicate that the microalloyed steel welded using P-GMAW has inherent advantage over the standard GMAW. The pulses intensified the vibration perturbation in the weld puddle which cause microstructural refining and increased formation of the acicular ferrite (AF) constituent. The higher percentage of AF present in the weldment resisted propagation of the crack during static tensile test. Microhardness, ultimate tensile strength and joint efficiency during P-GMAW are much higher than the samples welded by standard GMAW.

Keywords: AHSS; P-GMAW; HAZ; Acicular ferrite; Joint efficiency,

1097

A Simple Method for the Synthesis of Anatase-Rutile Mixed Phase TiO₂ using a Convenient Precursor and Higher Visible-Light Photocatalytic Activity of Co Doped TiO₂

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Abstract: This work reports a novel and simple method for the synthesis of mixed phase TiO₂ (Anatase 70% and Rutile 30%). Refluxing aqueous solution of potassium titanyl oxide oxalate lead to direct crystallization of titanium oxalate complex [Ti₂O₃(H₂O)₂(C₂O₄).3H₂O] and this complex on calcination at 450 °C for one hour yielded TiO₂ powder. The powder samples were characterized by XRD, Raman spectroscopy, FESEM-EDX, TEM, XPS, FT-IR, UV-Visible spectroscopy and BET techniques. The XRD, TEM and Raman spectra of TiO₂ indicates the coexistence of anatase and rutile phases. The XRD result shows that the primary particle size of anatase crystals is 8.3 nm and that of rutile crystals is 35 nm. From the UV-Visible DRS spectrum, the bandgap of TiO₂ was found to be 3.0 eV. Co-doped TiO₂ (Co:Ti ratio 1:99) was prepared by adding cobalt nitrate to the precursor solution. On Co-ion doping, anatase:rutile composition was changed to 84:16. The visible light photocatalytic activity of Co-doped TiO₂ was found to be better than that of undoped and Degussa TiO₂ due to higher visible light absorption caused by Co²⁺ energy levels due lowered bandgap.

Keywords: Mixed phase anatase-rutile TiO₂; Co-doped TiO₂; Photocatalytic activity ; Methylene blue degradation.

2024

Designing a Short, Potent, Pore-Forming Antimicrobial Peptide

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Abstract: Antimicrobial peptides (AMPs) are considered as promising candidates to combat emergence of multidrug-resistant bacteria. However, they usually have complex structures and are expensive to produce. Herein we design a short, potent, pore-forming antibacterial peptide utilizing the two basic features of AMPs: cationicity and hydrophobicity. The designed peptide, KLR is evaluated for its antibacterial potency. The results reveal that KLR is a potent AMP that inhibits growth of *E. coli* and *S. aureus* with minimal inhibitory concentration (MIC) similar to that of full-length AMPs and is non-toxic towards mammalian cells. We also show that KLR kills bacteria by forming membrane pores making it less susceptible to development of bacterial resistance.

Keywords: Antimicrobial resistance; Antibacterial assay; Pore forming peptide; Peptide-lipid interaction; Hydrophobicity; Cytotoxicity.

2029

Imidazole added Sulphamic Acid Single Crystals with Optimal Properties for Optoelectric Devices

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Abstract: Single crystals of imidazole incorporated sulphamic acid (IMSA) of 12 x 7 x 7 mm³ dimension were successfully grown by slow evaporation technique. XRD study reveals that the grown crystal has the tetragonal structure. Various chemical groups formed in the sample have been found by FT-IR spectral study. The linear optical parameters such as transmittance, reflectance, absorption coefficient, extinction coefficient, refractive index, optical conductivity and electrical conductivity of IMSA crystal have been analyzed Using UV-visible spectroscopy. Hardness studies reveal that the crystal shows reverse indentation size effect. An antibacterial activity developed by IMSA crystals against different pathogenic bacteria were examined using the Agar disk diffusion process. The antibacterial inhibitory activity of IMSA crystal revealed that it can be used to treat a variety of bacterial infections.

Keywords: XRD study; FTIR spectral study; Optical transmission; Hardness studies; antibacterial activity.

2026

Effect of Temperature on Yield and Nanostructure of Multiple Layers of Carbon Nanotubes

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Abstract: Nanotechnology devices, also referred to as future technology, are used in a variety of fields including electronics, computer technology, drug delivery, and medical diagnostics, attracting scientists, industrialists, journalists, governments, and even laypeople. Carbon nanotubes (CNTs) and other carbon nanostructures can play an important role in this nanotechnology. Because of its enormous application potential in nanotechnology, a massive amount of effort is being put into carbon nanotube projects all over the world. Until now, the art of CNT synthesis has revolved around streamlining parameters for selected bunch materials in a particular investigative setup. The long-term key to a manageable society is a healthy economy that effectively utilizes vitality and assets. As a result, there has already been sufficient opportunity to determine the viability of incorporating green techniques into nanotechnology. The aim of this research is to look into a natural green precursor for the synthesis of multiple layer carbon nanotubes (MLCNTs) using fatty acid methyl esters of *Arachis hypogaea oil* (Peanut oil) at temperatures ranging from 650°C to 875°C with intervals of 75°C on Fe-Co assisted on Silica under argon atmosphere. Scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), XRD, and Raman spectroscopic analysis were used to characterize the as-grown carbon nanomaterials. At all temperatures, we confirmed that the yield and diameter of as-grown MLCNTs were not the same. As the temperature increased from 650°C to 725°C, the crystalline flawlessness of CNTs increased first, then decreased as the temperature increased from 725°C to 875°C. The degree of graphitization of MLCNTs could be affected by the fabrication temperature, according to our findings.

Keywords: MLCNTs, Spray-pyrolysis, Transesterification, Fatty acid methyl esters of *Arachis hypogaea oil*, HRTEM; SEM, XRD analysis, Raman spectroscopic analysis & TGA Analysis.

2034

Structural and Spectroscopic Analysis of Pure Phase Hexagonal Wurtzite ZnO Nanoparticles Synthesized by Sol-Gel

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Abstract: In the present study, Sol-gel route was employed to synthesize the pure phase hexagonal wurtzite zinc oxide (ZnO) nanoparticles with crystallite size and lattice strain ~ 21 nm and $\sim 7.6 \times 10^{-4}$ respectively. The synthesized ZnO nanoparticles were characterized by X-ray Powder Diffraction (XRPD), Fourier Transform Infrared (FTIR) Spectroscopy and Raman spectroscopy at room temperature. FTIR spectrograph demonstrates the presence of stretching vibration of Zinc-Oxygen (Zn-O) bonding. The Raman active optical phonon mode $E_{2\text{High}}$ at 438.59 cm^{-1} confirms the formation of pure phase wurtzite hexagonal ZnO nanoparticles.

Keywords: ZnO nanoparticles, XRPD, W-H Plot, FTIR, Raman, Sol-Gel.

2042

Effect on Lotus leaf for Dielectric Applications

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Abstract: A dielectric study on lotus leaves was reported. Ball milling method was used to powder Sun-dried lotus leaves having thickness of $5(\mu\text{m})$ and $50(\mu\text{m})$. Frequency-dependent dielectric constant (ϵ'), complex dielectric constant (ϵ'') and dielectric loss/loss tangent ($\tan \delta$) were measured. The results are compared with available literature values and discussed.

Keywords: Lotus leaf, Dielectric constant, complex dielectric constant, Dielectric loss, Dielectrics, FTIR.

2054

Design of A 6 DOF Robot Manipulator for 3D Printed Construction

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Abstract: Robotics and their application in industrial automation are increasing over the decades. There are a variety of conventional and non-conventional applications of robotic manipulators. One example of the non-traditional application of robot manipulators is the 3D printing-based construction of houses and buildings. Up to date, different ambitious solutions and methods are proposed, and they are expanding fast. In large-scale production, 6 DOF robotic arms, designed by common manufacturers such as KUKA, DENSO are widely used in 3D construction. The main objective of this work is to model a 6 DOF robot manipulator for 3D printing-based construction technology. This paper presents two new designs of robot manipulators for construction purposes; one is to transport the building materials, and the other is to help print with the concrete mixtures. The simulation results are obtained applying fundamental theories of robotics through Roboanalyzer software. The simulation parameters are chosen for the designed specific model.

Keywords: Automation; construction; modeling; robot manipulator; robotics; 3D printing.

2056

Lateral Torsional Buckling of Steel Beams Strengthened by Steel Plate

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Abstract: An analytical study has been carried out to know the lateral torsional buckling of steel I beam strengthened using steel plate at bottom flange. Linear and nonlinear analytical study has been carried out using Abaqus software to know the behaviour of beams. For this analysis ISMB500 is strengthened using steel plate by varying the thickness of the steel plate. Welded connection is used for connecting steel plate and bottom flange of steel beam. The aim of the research work is to determine the ultimate bending strength unstrengthened and strengthened I beams. The load deflection behaviour of strengthened and unstrengthened beams also studied in this research work. Strengthening of steel beam using a steel plate significantly increases the load carrying capacity of steel I beam.

Keywords- Lateral torsional buckling, steel I beam, Linear and nonlinear, Abaqus, Ultimate bending strength, Strengthening.

2061

Effect of Filler Wire Strength on High Strength Low Alloy Steels

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Abstract: Fusion welding of Ti-Nb micro alloyed high strength low alloys (HSLA) steels often leads to softening of heat affected zone (HAZ) due to the changes arise in the microstructure. Apart from heat input and width of HAZ, selection of filler wire also plays an important role, to achieve the minimum strength requirement of the parent material. Steel plates with 800 MPa ultimate tensile strength were butt welded using pulsed gas metal arc welding (P-GMAW) process, with undermatching, matching and overmatching strength filler wires. Welding parameters were selected in such a way that the heat input per unit weld length is almost constant. In all the samples, microstructural features were similar in the HAZ region. Static tensile tests indicated that failure in the samples welded using undermatching filler occurred at welded region, whereas the samples welded with matching and overmatching fillers failed at HAZ region. Further fracture studies indicated that, in case of under matching filler wire samples, crack propagates along the Widmanstätten ferrite present in the weld zone, whereas in other two samples, crack initiated at coarse TiN – matrix interface in the HAZ region. This study shows that overmatching fillers are recommended to overcome strength loss due to HAZ softening.

Keywords: High strength low alloy steel; Pulsed gas metal arc welding; Weld microstructures; Crack propagation;

2067

Valorization of Soda Lime Glass in Cement Sand Matrix

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Abstract: Nowadays concrete and mortar demand as construction materials has been surged in market due to the exorbitant augmentation of the construction industry. Cement and fine aggregates (like river sand, pit sand etc.) are consumed in a large quantity to produce the mortar for various uses. In this venture, the cement and natural sand is been replaced with the soda-lime glass and the properties of mortar has been characterized for this replacement. Various proportions adopted for the cement replacement by weight 0 to 20 % and natural sand replacement by weight are used 0 to 30 % at 5% interval. The influence on the workability, density, water absorption, mechanical strength, drying shrinkage and Alkali Silica Reaction (ASR) expansion are assessed. Outcome of the investigation reveals that the dose of soda-lime glass replaced with cement and natural sand plays an important role to determine characteristics of cement mortar. Mortar made with Glass powder (GP) at 15% replacement with cement and Glass sand (GS) at 25 % replacement with natural sand have highest mechanical strength. Water absorption and density reduced by using soda-lime glass. Drying shrinkage mitigate by using waste glass. ASR expansion has reduces due to smaller particle size of glass. The pores refinement and porosity decrement occurs due to the calcium hydroxide (Ca(OH)₂) and glass powder reaction, this is a pozzolanic reaction that produces calcium silicate hydrate (C-S-H) gel.

Keywords: Pozzolanic reaction, soda-lime glass, Mechanical properties, water absorption, drying shrinkage, ASR expansion;

2081

Modelling of AOP Removal of β - Blocker Atenolol from Wastewater

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Abstract: Emerging contaminants in wastewater pose a greater threat to the environment and the organism in water bodies. The emerging contaminant Atenolol (ATL) belongs to a class of drugs known as beta-blockers. Even micro-level of these contaminants may harm the environment adversely. Hence removal of Atenolol and other emerging contaminants is given prime focus. In this study, modelling of Advanced Oxidation Process (AOP) as the treatment techniques for the removal of Atenolol was performed. Based on literature review, the input parameters for this study were chosen and includes Initial concentration of Atenolol (10 – 30mg/L), pH range (7 -11), TiO₂Catalyst Concentration (500 – 1000mg/L) and Reaction Time (40 – 120min). Further the two types of radiation (UV and Visible light radiations) were considered and the process modelled using MINITAB, regression equations and Pareto charts were obtained. In this study, the optimum experimental conditions for maximum removal of ATL was obtained for UV/ TiO₂ and Visible light/ TiO₂.

Keywords: Emerging Contaminants; Atenolol (ATL); Beta-blockers; Advanced Oxidation Process (AOP).

2083

Experimental Study on Near-Dry Wire-Cut Electrical Discharge Machining of Inconel 718 alloy

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Abstract: In this paper, Inconel 718 alloy has been cut by helium-mist wire-cut electrical discharge machining (WEDM) using a molybdenum wire tool. A little amount of water mixed with non-retractable pressurized helium gas was used to provide the insulation and cooling medium between the wire and workpiece. A new experimental setup has been developed to conduct the near-dry WEDM experiments with input parameters of the current(I), pulse-width (PW), pulse-interval (PI), and flow rate(F) of mixing water using Taguchi design of the experiment to predict the Material removal rate (MRR) and surface roughness (SR). It was revealed that pulse-width and current increase the MRR and SR; conversely, the pulse interval minimizes the MRR and SR. The highest MRR and SR are attained by the maximum flow rate of the dielectric medium due to quick flushing of debris components.

Keywords: Near Dry WEDM, Inconel 718 alloy, small amount of water; Taguchi Method

2084

Prediction of Mechanical Properties for Polyetheretherketone Composite Reinforced with Graphene and Titanium Powder Using Artificial Neural Network

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Abstract: High performance Polyetheretherketone (PEEK) hybrid composite were synthesized by reinforcing different wt% of Graphene (C) and Titanium powder (Ti) using Injection molding for applications such as compressor plate valves, piston parts, impeller wheels for regenerative pumps, shock absorber bearings, gears for oil and gas companies, cams, ball bearing cages aircraft exterior parts. For modeling and prediction of mechanical properties of PEEK/C/Ti composite, a multi layer perceptron feed forward neural network was constructed using input vectors as wt% of PEEK and reinforcements. Hardness, Tensile strength, Tensile elongation, and Modulus of elasticity are output vectors for polymer composite. The proposed ANN model for PEEK composites delivers satisfactory results in comparison to experimental measurements. The correlation factor connected with training and test dataset was greater than 0.9. 3-D plots for the predicted mechanical properties as a function of material compositions were established.

Keywords: Polyetheretherketone, Graphene, Polymer composite, Artificial Neural Network, Mechanical properties.

2087

Nanostructure Wrinkle Thin Films on Flexible Substrate: Tunable Optical Properties

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Abstract: Nanostructure wrinkle created by amorphous diamond like carbon (a:DLC) thin films on flexible Polyethylene Terephthalate (PET) substrate via chemical bath deposition technique was studied in details. Atomic force microscopy (AFM) image revealed that the nanostructure wrinkle pattern with varying wavelength from 350 nm to 170 nm are closely spaced and randomly oriented on the PET substrate. Raman spectra analysis showed that the chemical composition i.e., $sp^2/(sp^2+sp^3)$ bonding ratio in the deposited a:DLC nanostructure wrinkle thin films was varied by changing the sucrose weight percentage in the precursor solution used for a:DLC thin film deposition. The optical band gap energy decreased from 3.17 eV to 2.04 eV for the a:DLC nanostructure wrinkle thin films as increase the sucrose weight percentage in the precursor solution from 5 to 30 respectively. The disorderness and defect density in the a:DLC nanostructure wrinkle thin films calculated from Raman spectra as well as from Urbach energy calculation. The change in optical transmittance, extinction coefficient, refractive index and optical band gap energy has been discussed in terms of composition and nanostructure of the a:DLC wrinkle pattern thin films.

Keywords: Amorphous diamond like carbon (a:DLC), Nanostructure Wrinkle, Raman spectroscopy, Optical band gap energy.

3014

Investigation on Solid State Pyrolytic Decomposition of Bimetallic Fumarate and Tartrate Precursors of Co (II), Ni (II) and Zn (II) with Manganese

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Abstract: The complexes of Co (II), Ni (II), and Zn (II) with manganese were synthesized by coprecipitation techniques such as fumarates and tartrates. The formation of these dicarboxylate complexes characterized by elemental analysis, infrared spectroscopy, and X-ray powder diffraction studies. The thermal decomposition behaviors of these complexes were investigated using thermal analysis (TGA, DTG, and DTA) and d. c. electrical conductivity measurements under normal atmosphere. Based on conductivity measurements and isothermal studies, a probable mechanism for the decomposition was proposed. After dehydration, the anhydrous complexes decompose to yield respective carbonate intermediate in the temperature range 200 – 350 °C. Decomposition of this carbonate species to the formation of the respective spinel in the temperature ranges 350 – 500 °C. The infrared spectra and X-ray powder diffraction studies were made for the identification of intermediate products. The X-ray diffraction studies of the end product indicate that spinel such as CoMn_2O_4 , NiMn_2O_4 , and ZnMn_2O_4 formed as a final product. The electrical conductivity measurements were found to give additional information on the solid-state reaction as compared to that obtained from conventional thermal techniques (such as TGA, DTG, and DTA).

Keywords: spinel; co-precipitation; thermal decomposition; fumarates and tartrates complexes; electrical conductivity.

3022

A Critical Study and Analysis of Process Parameters of Selective Laser Sintering Rapid Prototyping

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Abstract: In the Rapid Prototyping process, surface finish is very critical as it affects the part quality. As Rapid Prototyping is moving towards Rapid manufacturing there is an increasing stress on obtaining good quality parts. Surface finish of Rapid Prototyping parts is becoming more and more important with more parts being used for end purposes. Good surface finish is required for better functionality and look, but also for cost reduction in terms of reducing post-processing expenditure. A critical study and analysis of process parameters behaviour has been carried out for assessing the surface quality of parts manufactured on Selective Laser Sintering Rapid Prototyping system. The principal concern of experimental work has been investigated for achieving better surface finish by which the life of parts is governed. The primary objective of study is to analyze the optimum process parameters of Selective Laser Sintering Rapid Prototyping system. The material selected for study is "Dura Form" and experimental work was carried out on selective laser sintering rapid prototyping machine DTM Vanguard 2500. Taguchi method is used to investigate the parameters and results are improved by using signal-to-noise methods. The major process parameters selected for study were Part Orientation, Laser Power and Scan Spacing. The study and analysis depict that Part Orientation has a major effect on the surface roughness of the part produced on Rapid Prototyping Machine. It has been observed from the study that lower value of Part Orientation level I (0 degree) gives better finish and this is because of less number of layers required for manufacturing of part. It has been observed from the study of second process parameter i.e. Laser Power that the surface finish was better at 16 W. Similarly, the surface finish obtained at lower values of Scan Spacing was for better as compared to higher values of Scan Spacing. The comparative analysis of three-process parameter indicates that the effects of variation of Part Orientation and Scan Spacing parameters are more as compare to Laser Power.

Keywords: Selective laser sintering rapid prototyping; part orientation; laser power; scan spacing; taguchi technique; signal-to-noise method and analysis.

3049

Carbon Dioxide and GHG Emission Reduction by Utilization of Groundnut Husk Ash in Concrete

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Abstract: The present paper aims to develop sustainable concrete to reduce the emission of carbon dioxide and other greenhouse gases. In the present study groundnut husk ash is used and in order to assess its environmental effect cradle-to-gate Life Cycle Assessment (LCA) of concrete is evaluated in terms of Global Warming Potential (GWP), Acidification Potential (AP), and Eutrophication Potential (EP). Results indicated that 12.5% replacement of cement with groundnut husk did not reduce the compressive strength. Life Cycle Assessment indicated that a reduction of 10%, 9.1%, and 7.2% of GWP, AP, and EP respectively in comparison to the control mix.

Keywords: Concrete; Groundnut Husk Ash; Global warming Potential; Life cycle Assessment; Carbon Dioxide Emission.

3052

Theoretical Study on Various Contributions to the Magnetization of $\text{Pb}_{1-x}\text{Eu}_x\text{Se}$

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Abstract: We report our results of magnetization (M) for diluted magnetic semiconductor $\text{Pb}_{1-x}\text{Eu}_x\text{Se}$. Our calculation includes two distinct contributions namely contribution from the localized magnetic impurity contribution (M_i) and contribution from the band effect (M_b). M_i has been calculated using a three-spin cluster model which comprises the clusters consisting of one-spin (M_1), two-spins (M_2) and three-spins (M_3). Moreover, M_3 includes both open triplets (M_{ot}) and closed triplets (M_{ct}). The statistical distribution of the different clusters has been considered using random distribution approximation in the dilute limit. The contributions from these clusters to the magnetization have been evaluated using a modified Heisenberg's exchange Hamiltonian in the nearest approximation. The magnetization has been calculated as a function of magnetic field and impurity concentration. The band effect includes the contribution from lattice diamagnetism (χ_{latt}). This mechanism has been considered in the effective mass formalism using a two-band $\vec{k}\cdot\vec{\pi}$ model. Our calculated values of M compare very well with experimental data where available.

Keywords: Diluted magnetic semiconductor; magnetization; orbital diamagnetism; $\vec{k}\cdot\vec{\pi}$ Theory; s - f hybridization.

3056

Recycled Substance Evaluation and Effect on Fire Resistance Structures

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Abstract: The dimensions 0.3x0.3x0.1 m, composed by the reinforced concrete (RC), prestressed concrete (PC), and Polypropylene reinforced concrete (PRC) and 28 days the strength & precise temperatures measured along surfaces. Mathematical models were planned to forecast concrete strengths when acquainted with thermal flare because numerous mechanical tests like compressive, tensile, flexural strengths and density are performed. Mechanical properties of various mixes of concrete beneath the effect of fireplace flame exposure are presented. Three distinct concrete mixes are prepared. The Bi-material concrete parts were subjected to fireplace flame temperatures travel from room temperature (27°C) at completely different ages of thirty, sixty and ninety days. At numerous heat levels of 400°C, 600°C and 850°C were elected to exposure length of 2.0 hours. When the hearth performance, concrete specimens were quenched in an exceedingly water tank to supply the most tremor because of sharp freezing. The experiment demarcates that the PC explosive ¼ hour after test start spalling begins. The panels with Polypropylene and RC panels maintained their integrity and structural stability for 4 hours, failing in the thermal insulation criteria at ¾ hours and 2¼ hours, respectively. The polypropylene panels depict no spalling of concrete, compared to control concrete for a more extended period and thermal insulation because of suitable properties.

Keywords: Recycled substance; RC; Spalling; fire insulation; PC; fire resistance;

3071

Evaluation of Solvent Transport and Cure Characteristics of Chlorobutyl Rubber Graphene Oxide Nanocomposites

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Abstract: Chlorobutyl rubber (CIIR) is a significant type of synthetic rubber with interesting properties and thereby finds applications in numerous fields. Insertion of nanofillers like organo clay, carbon nanotubes, graphene etc. into CIIR matrix reduces the permeability which is useful for the synthesis of membranes with less solvent and gas permeation. In this work, introduction of graphene oxide (GO) improved the cure characteristics of CIIR matrix. Bound rubber content also improved with increasing filler concentration. Moreover, a reduction in mol percentage of uptake was observed with increase in temperature. This study clearly shows the ability of GO in CIIR matrix to prevent the solvent transport through the polymer, which opens its application in chemical protective clothing.

Keywords: Chlorobutyl rubber; Graphene oxide; nanocomposite; Cure properties; Solvent permeability; Bound rubber.

3089

Evaluate the Optimum dosage of Nano Material on Self Sensing Properties for Nano Cement Composites

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Abstract: Structural health monitoring (SHM) is the method of realizing a damage recognition approach. Current damage detection approaches are either visual inspection or localized experimental methods such as ultrasonic methods. These methods can use if the damage is visible or in other words if damage is present at a particular area and if traditional sensors applied at that particular point then we can observe the damage through the sensors, i.e., traditional sensors will give us the values of damage detection only a limited number of points where they have applied. So now, there is a need for thinking regarding diffuse sensors. When Nanofillers added to the cementitious matrix, this cement Nanocomposite will behave as diffuse sensors; hence it will give the entire behavior of a structure. Nanocomposites prepared by taking cementitious matrix as cement paste and Carbon fiber (CF) and Multiwalled Carbon Nanotubes (MWCNT) as a Nanofillers. Cement Nano sensors prepared by varying percentages of MWCNT and CNF. Steel Meshes used as electrode materials. was selected as a cube specimen and were selected as a beam specimen. In the last step, the prepared cement-based sensors embedded inside the beam and column of size; the results show that all the proportions will have good mechanical and electrical properties.

Keywords: Cement composite, Smart structural health monitoring (SHM), Multi walled Carbon Nanotubes (MWCNT), Carbon fiber (CF), Cement-Based Sensors, Scanning Electron microscopy (SEM), Steel.

4002

Synthesis, Single Crystal X Ray Diffraction Analysis and Thermogravimetric Studies of a Novel Cu (II) Based Metal Organic Frame Work from Isophthalate and Pyridine Linkers

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Abstract: A novel Cu (II) based coordination polymer $[Cu(ipa)(py)_3]_n$ (1) (ipa = Isophthalic acid) has been synthesized from isophthalate and heterocyclic pyridine ligand and was well characterized by Fourier Transform Infrared Spectroscopy and Single Crystal X Ray Diffraction (SCXRD). Phase purity of the compound was analysed by powder X ray Diffraction (PXRD). The thermal behavior of the compound was also studied by Thermogravimetric analysis (TG). SCXRD studies revealed the compound to be a 1D- coordination polymer with asymmetric unit belonging to monoclinic crystal system with space group $P 2(1)/n$ [$a = 9.1209(2)$, $b = 15.3603(3)$, $c = 16.0084(3)$, $\alpha = 90.00$, $\beta = 92.2250(10)$, $\gamma = 90.00$] and the central atom Cu (II) possessing a trigonal bipyramidal based geometry.

Keywords: Metal Organic Frameworks, Isophthalic acid, SCXRD;

4019

Evaluation of Normalized Thickness Variation of Superplastic Cone Forming

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Abstract: Superplastic Forming (SPF) is the designers first choice for producing the products that have complexity as used in automobiles and aircrafts, in which the ratio of strength to weight is the major concern. SPF of sheet widely used in the manufacture of the products with more significant complexities simultaneously lighter and stronger than with any other manufacturing process. Superplastic formed products having shapes like hemispherical, conical and box results significant variation in thickness. Lowest thickness will be at the locations where the sheet contacts the die at the last. Complexity of the product, forming depth, and pressure affect the thinning. Unmitigated understanding of stress, strain rates, and strains during the forming process and the use of suitable pressures for forming can reduce this problem. In this study Lead & Tin alloy has chosen, as an exemplar material for Superplastic forming to carryout investigations. The results obtained can be applied for any other superplastic materials. The present investigation focused on studying suitable strain rates and Normalized Thickness Variation during the superplastic cone forming. Results revealed that Normalized Thickness Variation(NTV)is lower i.e., 2.27when formed at the pressure of 3 bar, which provides an equivalent strain rate of $1.1 \times 10^{-4} \text{ sec}^{-1}$. Therefore 3 bar pressure is desirable for cone forming. Results also disclosed that strain rates obtained in this investigation are in the limits of superplastic forming zone and hence no fracture happened on the conical dome due to the thinning.

Keywords: Superplastic forming, Normalized thickness variation, Conical shape, Stress, Strain, Strain rate;

4021

Peroral Delivery of Risedronate Sodium for Treatment of Osteoporosis

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Abstract: Oral route of administration is considered as most widely accepted route which is a potential site for drug delivery, direct access to systemic circulation and site of action. Bisphosphonates are the class of drugs which have been approved for clinical use in osteoporosis and other bone diseases. Bisphosphonates are very poorly absorbed from the GI tract and have limited bioavailability of less than 1% with adverse gastrointestinal effects in humans. The present work aimed to develop sublingual spray formulation using Risedronate sodium with combination of Pullulan gum and HPMC E5. Formulation of sublingual spray was developed by employing optimization technique. The optimized formulation was selected and evaluated for various pharmaco-technical parameters such as viscosity, spray angle, drug content per actuation, *In-vitro* drug diffusion study, *Ex-vivo* permeation study and *In-vivo* pharmacodynamics study by glucocorticoid induced model in rats. Pharmaco-technical parameter results of optimized formulation showed satisfactory results. Comparative *In-vitro* drug permeation and *ex-vivo* permeation studies showed maximum drug release of 85% for optimized formulation incorporated with permeation enhance transcutol. *In-vivo* pharmacodynamic study showed better efficacy in treatment animals with optimized formulation and thus newly developed risedronate sodium sublingual spray proved to be effective used in treatment of osteoporosis.

Keywords: Risedronate Sodium, Pullulan gum, HPMC E5, Transcutol, Sublingual Spray

4049

Optimization of Cutting Forces and Tool-Tip Temperature in Turning of Nickel-Based Superalloy using FE Simulation

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Abstract: Ni-based superalloys have various uses in the automotive, marine, and aerospace industries, owing to their oxidation and heat resistance. Machinability characteristics are obtained by actual machining trials, which is a time-consuming and costly technique. The current project's goal is to study and simulate nickel-based superalloy turning. The Inconel 718 material is considered in the study. The results were obtained using the ANSYS finite element (FE) tool. The machinability features obtained through FE simulation are compared to experimental results published in the literature. The Design of Experiments (DOE) tool is adopted in this study to design the experiments and optimize the cutting variables for the tool-tip temperature and cutting forces in turning of nickel-based superalloy.

Keywords: Cutting forces; DOE; FE simulation; Inconel 718; Tool-tip temperature; Turning; Nickel-based superalloy.

4051

Acoustic Emission Test Method for Investigation of M250 Maraging Steel Pressure Vessels for Aerospace Applications

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Abstract: Quality and reliability are principal concern in rocketry due to the involved costs and risk. Large size industrial components like pressure vessels manufactured out of M250 Steel are one of the critical sub-systems. In spite of the best efforts in the design aspect and quality evaluation during production, online structural integrity evaluation is still a challenging assignment. A quick survey of the available Non-Destructive Evaluation (NDE) techniques suggests Acoustic Emission (AE) as the only viable method. Such a real-time monitoring of the pressure vessel casings will help in identifying any impending failure in terms of structural integrity degradation even at an earlier stage and thereby necessary corrective actions could be taken-up that save a lot of costs and time in addition to allow to produce quality products. The current manuscript details various steps involved in acoustic emission testing of pressure vessels. The testing process involves stages like attenuation measurement, wave velocity measurement, sensor layout, pressure cycle determination, online testing and data interpretation. Based on in depth attenuation studies, the various sensor layouts adopted for testing pressure vessels are discussed at length. Some of the general practices and requirements in AE testing are discussed. Various efficient triangulation techniques are presented. The pressure cycle and pressurization rates to be followed are explained in connection with AE data acquisition. Various AE parameters to be ensured during online testing are enlisted.

Keywords: Acoustic Emission, Maraging Steel, Structural integrity, NDE, Non-Destructive Testing.

4053

Analysis and Optimization of Nozzle Distance during Turning of EN-31 Steel Using Minimum Quantity Lubrication

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Abstract: Traditional high volume cutting fluid is normally applied during manufacturing of product at shop floor to minimize severity of friction, wear, temperature and machining forces. It impacts the manufacturing performance if the choice, application, handling and disposal of cutting fluid properly designed. Contrary to this, higher volume flow rate of metal working fluids applied in flood lubrication would adversely affects the environment, machine, materials, human and costly too. Hence for ensuring the economy and ecology of machining process the high discharge rate of cutting fluids should be minimized. Therefore, machining should be conducted in such conditions where the aforementioned limitation should be avoided i.e. dry and minimum quantity lubrication. However, dry machining has limitation at higher levels of input variables so becomes unsuitable for mass production of difficult to cut materials. Therefore, in present investigations the minimum quantity lubrication of vegetable based oil has been utilized for investigating its impact the cutting temperature at different nozzle distances. The outcomes of changing the nozzle gap on temperature during turning of EN-31 Steel have been analyzed with ANOVA. The investigation results suggested that cutting speed has greater influence (68.44%) on temperature along with nozzle distance (30.75%).

Keywords: Minimum quantity lubrication (MQL), Vegetable oil, Cutting temperature, Taguchi L-9 array, ANOVA.

4060

Novel Graphene-Based OPFET for Optoelectronic Applications

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Abstract: Graphene-based FET (Field Effect Transistor) has been widely explored for high-speed optical applications such as photodetectors and terahertz modulators. On the other hand, graphene MESFET (Metal-Semiconductor Field Effect Transistor), which is not yet explored, bears a thin line of distinction with respect to the graphene FET, i.e. the oxide/insulator capacitance in graphene FET is replaced with dipole capacitance in graphene MESFET. This thin difference creates a significant variation in the characteristics of both devices. This paper comparatively analyzes the photogating, high-frequency amplification, inter-band, and intra-band performance of graphene FET and graphene MESFET devices for photodetection and terahertz modulation applications.

Keywords: Graphene; FET; MESFET; dipole capacitance; photogating; intra-band.

4086

Effect of PCB as Partial Replacement of Fine Aggregate and Coarse Aggregate in Concrete

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Abstract: Concrete, being an universal building material that is being used as a recycling medium of industrial by-products as well as waste materials due to the harmful environmental hazards by dumping the later directly on to the earth. However, the mechanical and durability parameters are not compromised instead it enhances the overall performance of the concrete by inclusion of these waste materials and by-products. In this study, electronic wastes(e-waste) expelled out from the hardware industry are used as a replacement material for the aggregates in developing e-concrete. Owing to its lower recycling rate, it steadily becomes perilous to the environment thus paving way for an ecological imbalance. The utilization of printed circuit boards (PCB) as aggregates in concrete may also mitigate the cost of construction by minimizing the usage of the aggregates procured from the nature thus inducing greener concrete. This experimental study is an attempt to introduce the PCB as a partial substitute for both the fine aggregate and coarse aggregate at different percentage of 0%, 5% ,10% ,15% and 20%. The e-concrete thus developed is then compared with conventional concrete for its mechanical properties and long-term behavior against sulfate attack. The results indicate that, replacing both the fine aggregate and coarse aggregate at 5% tend to improve the concrete behavior adequately enabling the PCB as an ideal choice of replacement thus providing a safer choice to eliminate these e-waste without affecting the ecological balance.

Keywords: e-waste; e-concrete; PCB; mechanical properties; sulfate attack; replacement; green concrete.

4088

Finite Element Analysis of Polymeric and Cementitious Materials to Secure Cracks in Concrete

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Abstract: Concrete structures are rigid in nature with high load carrying capacity and brittle nature. The volumetric changes that occur in concrete due to various reasons such as shrinkage during construction to chemical exposures and thermal stresses at later stages results in the formation of cracks in concrete. Cracking is the onset of distress in concrete and should be fixed at earlier stages to avoid rapid deterioration of the structure. Concrete and mortar are not a viable solution to fix cracks, as they do not bond with the old concrete resulting in low finishing strengths. This is where materials such as epoxy, hydraulic cement, polyurethane and acrylic modified mortar comes into picture. This paper reports an extensive study on the behaviour of epoxy, hydraulic cement, polyurethane, and acrylic resin modified mortar in their effectiveness as crack filling materials when subjected to loads using finite element analysis.

Keywords: Epoxy resin, Hydraulic cement, Polyurethane, Acrylic modified mortar, XFEM

4090

Numerically Approach for Enhanced Mass Transfer of Bio-Convection on Magneto-Hydrodynamic Carreau Fluid Flow through a Nonlinear Stretching Surface

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Abstract: The present study deals with an investigation of steady two dimensional flow of Carreau fluid covering both the motile microorganism and nanoparticles through a nonlinear stretching surface. The idea of microorganisms is implied just to stabilize suspended nanoparticles by convection. The governing PDEs (partial differentiable equations) are transform set of nonlinear ODEs (ordinary differentiable equations) using appropriate similarity transformation. The nonlinear system of coupled differentiable equation solved by Runge-Kutta-Felhberg with shooting method. The performance of fluid microorganism density, concentration, temperature, velocity have different values of physical parameters are scrutinised. The numerical results are presented through graphs and tables. Numerical values of skin friction, local Nusselt number, Sherwood number and local density number are analyzed. This study relevant to navel microbial few technologies combining the Nano fluid with Bio-convection.

Keywords: Bio-convection, microorganisms, thermal radiation, Carreau fluid, Brownian motion and thermophoresis parameter.

4091

Elastic and Mechanical Properties of Titanium Diboride under High Pressure

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Abstract: With the application of developed DFT theoretical formalism, the calculation of the physical, mechanical, and thermal properties for Titanium Diboride TiB_2 under High Pressure from first principle calculations are described in this paper. The calculated mechanical properties using Voigt and Reuss approximation for Bulk (B), Young (E) and Shear Modulus (G) (in kbar) and Poisson ratio (n) for different pressure ranges (0 to 200 GPa) have been reported

Keywords: DFT; TiB₂; Pressure.

5002

Evaluation of Strength Parameters of Ultra-Fine Flyash and Nanosilica Incorporated High-Performance Concrete

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Abstract: The effect of ultra-fine fly ash (UFA) and nanosilica on the strength properties of High-Performance Concrete are investigated in this study (HPC). Cement was replaced in varying batches with UFA at 0%, 10%, 20% and 30% by weight of cement. Nanosilica was added at a rate of 0 %, 1.5 %, 3.0 % and 4.5 % by weight of the binder. Water-to-binder ratios of 0.3, 0.325, 0.375, 0.4, and 0.425 were used in the mix design. All of the concrete mixes were evaluated for compressive strength at 7, 28, and 90 days, as well as split tensile and flexural strength at 7 and 28 days. Conclusions were drawn by comparing the results with conventional concrete. The HPC with 10% UFA, 3.0% nanosilica, and 0.30 water-to-binder ratio had the best results, with compressive strength gains of 28.24 %, 28.11 %, and 31.89 % at 7, 28, and 90 days, respectively. Tensile strength increased by 21.84 percent and 38.56 percent after seven and twenty-eight days, respectively, while flexural strength improved by 39.26 percent and 24.37 percent. Mathematical relationships between cube compressive strength and split tensile strength, as well as flexural strengths, were developed as a result of this research..

Keywords: High-Performance Concrete; Mechanical Properties; Ultra-Fine Fly ash; Nano silica; Regression Analysis.

5007

Assessment of Asphalt Binder and Mixes Modified with Zycotherm and Sulphur

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Abstract: In this study bituminous concrete mixes were prepared by adding Zycotherm as modifier and Sulphur as an extender. The physical properties of bitumen blended with Zycotherm and Sulphur were evaluated. For preparing the hot mix asphalt specimens, bitumen was modified with 0.05%, 0.1% and 0.15% of Zycotherm. Sulphur was used as an extender and its percentage was fixed to 35%. Comparison was made between the optimum binder content (OBC) of mixes prepared with neat and modified bitumen prepared using the Marshall mix design. For this purpose, a total of 8 type of asphalt mixtures were made. The OBC was determined and other parameters such as Marshall stability, flow value, voids filled with bitumen (VFB), voids in mineral aggregates (VMA) and unit weights were evaluated at this binder content. Based on the above experimentation and testing, it was concluded that the aggregates and bitumen (virgin and modified) results satisfy the standard requirements and the results are within the specified limits. Comparatively, in terms of physical properties, bitumen containing Sulphur content showed changes up to large extent than Zycotherm modified bitumen. Zycotherm modified bitumen showed a minor change in the physical property of bitumen but the incorporation of 0.1% Zycotherm with 35% Sulphur, indicates the utmost Marshall stability and Marshall quotient value at the optimum binder content of 5.43 %..

Keywords: Bituminous concrete; Zycotherm; Sulphur; Marshall stability; Marshall Quotient; Optimum Binder Content.

5009

Effects of Crack Location and Depths of an Iron Bar: A Finite Element Approach

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Abstract: Structural Health Monitoring has become a significant issue in numerous engineering fields and industries. Early detection of damage such as cracks, as well as their depth and location, could be a major research topic. In this research, the natural frequency of a cylindrical solid shapes iron bar together with two half-circle surface crack has been investigated by Finite Element Method (FEM) using COMSOL Multiphysics Software. Vibration Analysis has been used to predict response and different crack depths are the main parameters for analysis to access structural integrity performance of the domain. It is found that lowest frequency of intact bar was higher than the lowest frequency of the cracked bar, and frequencies decreased as the crack depth increased. Using this method very small sizes crack (minimum 0.05 mm) can be defined in any structural body.

Keywords: Structural Health Monitoring; Iron Bar; Crack detection; Crack Depth; Modal frequency; Vibration Analysis; FEM.

5012

Evaluation of Cerium Oxide Nanoparticle as Corrosion Inhibitor for Mild Steel

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Abstract: This study deals with the resistance to corrosion with nanostructured materials since they consume less energy and can be employed in a variety of lightweight applications. For this study, nano-sized cerium oxide had been used as an anti-corrosive inhibition. This CeO₂ nanoparticle was synthesized utilizing a hydrothermal technique. The coating was obtained by mixing various concentrations of CeO₂ nanoparticles with a water-based epoxy resin. Resistance to corrosion with the formulated coating on a mild steel substrate was tested inside a simulated concrete pore solution containing 0.5M NaCl solution. The corrosion inhibiting effect was evaluated by immersing the nano CeO₂ – Epoxy composite coated mild steel substrate in a simulated concrete pore solution utilizing electrochemical impedance spectroscopy methodology. Tafel tests were used to calculate the corrosion rate. The outcomes showed that the nano-sized cerium oxide as filler material for epoxy covering displayed a superior corrosion inhibiting effect along with the commencement of a stable protective shield when compared to substrate of pure epoxy and without coating.

Keywords: Cerium oxide; Waterborne epoxy resin; Simulated concrete pore solution; Anticorrosive inhibitor

5025

Analysis of the Thermoluminescence Glow Curve of CaSO₄: Dy Phosphor by Simplified General One Trap Differential Equation

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Abstract: Thermoluminescence (TL) analysis of CaSO₄: Dy phosphor has been performed using a recently formulated simplified General One Trap (GOT) equation. The analysis shows the activation energy of the phosphor to be in the range of 1.014 – 1.421 eV and the frequency factor to be in the range of 10⁹ to 10¹¹ s⁻¹. Furthermore, the analysis of the TL curve in the new simplified GOT equation provides information on the behavior of the empty traps and how many of them are filled. The analysis of the TL curve in the simplified GOT equation shows that about 32-65% of the empty traps of the main dosimetric peak of CaSO₄: Dy phosphor takes part in the retrapping process, which is a basic requirement of a dosimetric peak. This vital information was missing in the previously reported TL analysis of the CaSO₄:Dy phosphor.

Keywords: Thermoluminescence, CaSO₄:Dy, Activation energy, OTO, frequency factor.

5027

Influence of Glass Powder and Hydrated Lime on Strength Properties of Concrete

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Abstract: Demand for concrete has been rising with time to fulfill the construction requirements, which in turn will also give rise to the carbon content in atmosphere. This experimental study is mainly focused on the use of elective materials, that can concrete be used in concrete as replacement and increment the assistance life of solid designs, which is fundamental from the ecological and mechanical perspective. In this specific situation, the replacement of concrete in cement by pozzolanic material can be proceeded as ternary combinations for example the joined fuse of glass powder and hydrated lime, empowering the decrease of concrete utilization and the minimization of the CO₂ outflows and the regular asses utilization. Thusly, this exploration assessed the joining of glass powder and hydrated lime in a secluded and joined manner, as fractional addition for concrete in cement. In this paper, various replacements had been done to check the appropriate replacement percentages which show the best results for mechanical properties of concrete. It was concluded that the combined use of glass powder and hydrated lime in concrete allowed for the replacement of up to 15% GP (glass powder) and 30% HL (hydrated lime) in the concrete, improving microstructure and increasing attributes related to compressive, Split tensile and Flexural strength at 28 days. Furthermore, the samples with the best quality were tested for SEM and XRD.

Keywords: Glass powder; Hydrated lime; Mechanical properties; Microstructure;

5075

Fly-Ash Conjoined Ground Granulated Blast Furnace Slag Proxy for Fresh and Hardened Responses

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Abstract: The cement business is the second-largest source of greenhouse gas emissions after the oil and gas industry. As the demand for cement in the construction business increases, the environment is affected; therefore, wastes such as GGBS and flyash are used instead of cement. Comparing the strength performance of M25 concrete, its constant fly ash content is 20%, and GGBS is used to replace 10%, 20%, 30%, 40% and 50% of the cement part, and compared with PCC. The replacement concrete's Vee-Bee test, compression ratio, and mechanical strength (tensile, compressive and flexural strength) were also tested. For M25 concrete, samples taken at 3, 7, 14, 21, and 28 days after increasing the setting time were analyzed, and the settlement, compaction coefficient and mechanical strength of the concrete were analyzed. It contains GGBS and fly-ash. The results show that adding GGBS and flyash to the concrete improves the cooling and hardening performance, thereby improving the mechanical properties of the concrete. The strength properties of GGBS concrete gives peace of mind and encourage researchers in the construction trade to use it all the time. Cement production causes Environmental problems, and it has been solved by finding alternative materials for products such as fly ash and GGBS.

Keywords: Fresh and hardened possessions; High-Performance Concrete; GGBS; Fly ash; Recycled Concrete; Mix Design;

5083

Anti Bacterial and Anticancer Activities of Quinoxaline-2-Carbohydrazide-N-Oxide Compounds

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Abstract: A series of quinoxaline 1,4-di-N-oxide derivatives was synthesized. Ethyl-3-hydroxyquinoxaline-2-carboxylate (1) on reaction with hydrazine hydrate in ethanol yielded 3-hydroxyquinoxaline-2-carbohydrazide(2). This product on condensation with different aromatic aldehydes yielded N-4-bromobenzylidene)-3-hydroxyquinoxaline-2-carbohydrazide(3) which upon reaction with mCPBA in THF resulted in the above-mentioned products. These derivatives were evaluated for their anti-bacterial activity using four different strains. A few compounds among them were also evaluated for their anti-tumour activity towards breast cancer (MCF7) and cervical cancer (HeLa) cell lines. All the compounds were characterized by IR, ¹H NMR and Mass spectroscopy.

Key words: Cytotoxic, di N-oxides, Hypoxia, MTT assay, o-Phenylenediamine.

5086

Effect of Wave Shift of Porous Slab on Thermo-Hydraulic Transport Characteristics of Laminar Flow through a Wavy Channel

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Abstract: The finite element method is adopted to investigate the thermo-hydraulic transport characteristics of two-dimensional, steady, Newtonian flow through wavy channel, which has a porous wavy slab. Water is taken as working fluid with Prandtl number $Pr=6.93$ and Reynolds number $Re=700$ considered for all simulations. Results are investigated in the form of average Nusselt number (Nu_{avg}), Enhancement ratio (ER), Pressure drop (Δp), Pressure ratio (PR), and Performance factor (PF) for different wave amplitudes ($\alpha = 0.06, 0.12, \text{ and } 0.18$) and wave phase shifts ($\phi = 0^\circ, 45^\circ, 90^\circ \text{ and } 180^\circ$) of porous slab at different Darcy numbers ($Da = 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}, \text{ and } 10^{-2}$). Results relive a significant increment in average Nusselt number with decreasing in darcy number on the penalty of pressure drop. The maximum value of ER found for geometry configuration $\alpha = 0.18$ and $\phi=90^\circ$ at Darcy number $Da = 10^{-6}$ and on the other end, maximum PF is obtained at Darcy number $Da = 10^{-2}$ irrespective of geometry configurations.

Keywords: Porous slab; Wave amplitude; Wave phase shift; Enhancement ratio; Performance Factor.

5089

Design Optimization of Strain Gauge Mounting Cross Section Length of Strain Gauge Balance Component for Wind Tunnel Application

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Abstract: The main purpose of this study is to optimize strain gauge mounting cross section length of strain gage (gauge) balance component to measure forces and moments experienced by test models. This is done by using three dimensional models of balance components and the results are analysed using High- fidelity Finite Element Modeling Altair Hypermesh Software. It may be noted that a maximum diameter of 25 mm and 200 mm length is permitted for strain gauge balance component design. The material used for the balance is Maraging C-250 Steel with maximum yield stress of 1655 N/mm². It is very important that designer is supposed to choose the strain gauge mounting cross section length by considering the limits of the design. Distance between front and aft loading location is specifically 100 mm. The present work involves design of cross sectional length for wind tunnel integral strain gauge balance component with minimum factor of safety of 2.5, maximum deflection of 1.2 mm and maximum stress 662 N/mm² which is permitted.

Keywords: Gage length, Integral strain gauge balance, Maraging C-250 Steel, Hyper mesh, Finite Element Method (FEM).

1016

Biological Material in Self-Healing of Concrete

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Abstract: Bacterial self-healing is an innovative technology which repairs cracks in concrete by precipitation of calcite. The biological method improves the service life of concrete. The research work is focused on accessing the performance of synthesized microbial agent in repairing cracks in fly ash concrete. Addition of microbial agent in cracks improved the properties of concrete. Strength was found to improve by 10 % and durability by around 6% in micro-repaired concrete with microbial solution to water ratio of 0.5. Scanning electron microscope of bacterial samples showed presence of calcite near microbial cells. The synthesized bio-based agent would act as an appropriate bio-agent to heal cracks in concrete. Use of bio-based agent would lead to environmental and economical benefit. Over all the maintenance and repair cost could be reduced and also play a role in reducing green house gas emissions and help to develop sustainable concrete.

Keywords: Microbial-healing; Mechanical strength; Water absorption, SEM observations.

1048

Theoretical investigation of ferroelectric Phase transition, and Tangent delta in CsH_2AsO_4 (CDA) crystal

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Abstract: In this present work, Cesium Dihydrogen Arsenate of ordered dis-ordered type H-bonded crystal is theoretically investigated. Presently modified model (PLCM) by adding some extra terms, like direct spin-spin terms, third-order and fourth-order phonon anharmonic terms, and extra spin-lattice terms. By using the Green function approach and Dyson's equation, formulae for various quantities are found out. Thermal variations of Cochran's mode frequency, electrical permittivity, phase transition, tangent delta, shift, and width are obtained for Cesium Dihydrogen Arsenate crystal. A comparison with theoretical findings has been made with the experimental finding reported by Blinc *et al* [8]. A good agreement is seen.

Keywords: -Electrical Permittivity, Tangent Delta, Phase transition, Coupling constant, and Cochran's mode frequency.

2030

An Investigation on Fatigue Behaviour of Bi-Directional Fibre Reinforced Polymer Nano Composite Using FEA Solver

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Abstract: The world is looking for innovative lightweight materials without compromising its mechanical characteristics, because of rapid industrialization, people's specific needs and demands. Glass fiber reinforced polymer composites are the promising materials from few decades. Glass fibers reinforced polymer composites have been prepared by various manufacturing techniques and are widely used for various applications. Nowadays, it has been used in electronics, aviation and automobile application. In this present work LY556-polymer epoxy resin is reinforced with S glass fiber and SiO_2 nanofiller. Glass fibers are having excellent properties like high strength, flexibility, stiffness and resistance to chemical harm. Each type of glass fibers have unique properties and are used for various applications in the form of polymer nano-composites. Nano materials in polymer nano-composites (PNC) play major role in mechanical properties. PNC's are one of the novel materials, which give better functional properties than other materials.

Fatigue failure in complex structures cannot be predicted earlier. Fatigue cracks can be initiated and propagated at stresses well below the yield strength of the material. In this paper, it is explained the fatigue behavior of PNC's using FEA solver to determine the strength properties and to compare both analytical and experimental values of fatigue testing

Keywords: Glass fiber, SiO_2 , Flexural strength, Fatigue, FEA solver.

2048

Structural and Morphological Properties of Bismuth Telluride Nanoparticles Synthesized by Two-Step Hydrothermal Method

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Abstract: Bi₂Te₃ nanomaterials have been synthesized using the two-step hydrothermal method at 160 °C. The structures and morphology of the samples were characterized by X-ray diffraction (XRD), Field Emission Scanning Electron Microscope (FESEM), High Resolution Transmission Electron Microscopy (HRTEM) and Selected Area Electron Diffraction (SAED). The growth mechanism of the grown of Bi₂Te₃ nanostructures has been discussed.

Keywords: Hydrothermal method; Bismuth Telluride; Nanoparticles; Thermoelectric material.

2058

Melting Phenomena of Cu_{0.25} Ni_{0.75} Bimetallic alloy: A Molecular Dynamics Approach

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Abstract: Alloys of transition metals draw attention from the scientific community due to the interesting physical and thermal behaviour they exhibit over their pure metal components. Atomic Molecular Dynamics Simulations on Pure copper (Cu) metal, nickel (Ni) metal and their Ni rich alloy (Cu_{0.25} Ni_{0.75}) have been carried out using the second nearest neighbor modified embedded atom potential parameters to investigate on the melting phenomena of the Ni rich alloy. The variation of average potential energy with respect to temperature is used to estimate the melting point temperature. Various other analyses such as; specific heat, mean square displacement of atoms and self-diffusion coefficients of atoms have been calculated in order to determine the exact transition region in the metals and to mark the melting point temperatures. The results show that the melting temperature of the Ni rich alloy is more as compared to its pure components (Cu and Ni). For the alloy, the calculated melting temperature is 2430K ± 5K, whereas that of the pure Cu metal is found to be 1900K ± 5K and pure Ni metal is 2370K ± 5K. The study shows that the alloy under investigation is comparatively more thermally stable than pure Cu and Ni..

Keywords: Metal; bimetallic alloy; MD simulations; Melting phenomena; Specific heat; 2NN-MEAM Potential

2073

Significance of Dynamic Control on Suddenly Expanded Flow when Nozzles are over, under, and Perfectly Expanded

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Abstract: In this paper, investigations are carried out to quantify the usefulness of the flow control in the recirculation and the growth of the flow in the tube at supersonic Mach numbers for pipe diameter 18 mm. Only those cases are shown when there is an effect of the flow control management on the stream pattern. Mach numbers of study are 1.87, 2.2, and 2.58 at various expansion levels for duct sizes 2D, 4D, 6D, and 10D. For the highest duct lengths, 6D and 10D flow fields of the duct turn oscillatory and control reversal phenomena are observed. For short ducts 1D and 2D, no such phenomena are seen. When nozzles face under-expanded or over-expanded flow at Mach 1.87 and 2.2, the flow control management does not give the needed outcomes and results in decreased pressure. Also, it is seen that at Mach 2.58, nozzles remain over-expanded, and when control is used, they end up in a rise of pressure of the tube. The minimum duct size requirement for the first two Mach is 1D, and for the highest Mach of the study, it is 3D.

Keywords: Static Pressure; Area Ratio; Supersonic Nozzle; Dynamic Flow Control; Tinyjets; Sudden Expansion

2075

Factors Influencing Mobility in ITO Thin Films and the Consequent Effects on Optical and NIR Surface Plasmon Resonance Properties

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Abstract: Metal oxide-based plasmonics is an emergent field for which indium tin oxide (ITO) is a promising material. Improving the performance of ITO-based surface plasmon resonance (SPR) sensors requires a deeper knowledge of their optical and electrical properties. The effects of microstructural parameters and defects on mobility, which strongly influences SPR in the near-IR regime was explored. The proposed model incorporates different scattering mechanisms and non-parabolic conduction bands to obtain realistic values of mobility. The results show that larger grain sizes and higher carrier concentrations in ITO thin films improve SPR performance at near-IR wavelengths as low as 1300 nm..

Keywords: Light-matter interaction; Surface Plasmon Resonance; Plasmonics; Nanophotonics; Transparent conducting oxides; Indium tin oxide.

4010

Temperature Stresses in Functionally Graded (FGM) Material Plates using Deformation Theory – Analytical Approach

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Abstract: The advancement in the field of composites lead to the development of a new material called Functionally Graded Materials (FGMs). The concept of grading two distinct materials is introduced in FGMs to withstand high temperature variations across thin section. In this study analytical formulations and theoretical solutions were developed for the FGM plates subjected to thermal loads using refined computational model based on First Order Shear Deformation Theory (FSDT). Material properties are based on Power-law function. The effects of thermal stresses are studied for constant, linear and nonlinear variation of temperatures across the thickness of the plate, whereas in-plane is assumed to be sinusoidal. The accuracy of solutions are established with the literature. Parametric studies are performed and numerical results are presented for the simply supported FGM plates. Comparative studies are performed between various temperature profiles and bench mark results are presented for displacements, in-plane and transverse stresses.

Keywords: Functionally graded plates (FGM); Analytical formulation; Power-law function; Thermal stresses; First order shear deformation theory (FSDT);

4012

Stabilization of Cr⁺⁶ in Sodium Dichromate Plant Residue through Down Draft Sintering (DDS) Technique and its Application in Manufacture of Building Bricks

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Abstract: Chromium bearing compounds have wide range of applications in various fields. Sodium dichromate is also one of the important chemical with various applications in different sector. Mostly it is manufactured by roasting of soda with chromite ore which is a traditional manufacturing process. But the leaching of Cr⁺⁶ in the resulted residue is the major environmental problem of this process which is a worldwide concern. In the current research work attempt has been taken for treatment of sodium dichromate plant residue through Down Draft Sintering (DDS) technique. The Cr⁺⁶ content of the residue is 10000ppm. To stabilize the huge concentration of Cr⁺⁶ is also a major research challenge. The experiment has been carried out in 50kg scale. The dichromate residue along with some lime bearing additives has been mixed in 30%, 40% and 50% respectively and ground all together upto 400 micron size. After that the ground mixture has been pelletized by help of a mechanical pelletizer. The pellets have been used as sinter feed. During sintering process, the temperature has been maintained in a range of 1250-1300°C. After cooling of the sintered pellet for 30minutes, the leaching of Cr⁺⁶ has been carried out. The leachate has been analysed by Diphenyl Carbazide method and the results showed that it contains 0.004, 2.18 and 4.69 ppm of Cr⁺⁶ respectively. The treated sintered dichromate residues have also been utilized in manufacture of building bricks.

Key words: Dichromate plant residue, treatment, DDS technique & building bricks

4023

Development of Green Geo-Adsorbent Pellets from Low Fire Clay for Possible Use in Methylene Blue Removal in Aquaculture

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Abstract: Mesoporous clay ceramic pellets have been prepared by sintering silica rich low fire clay at two different temperatures (650°C and 850°C). The prepared ceramic pellets were characterized using FTIR, SEM, XRF, compressive strength and water adsorption capacity. Methylene Blue removal capacity of ceramic pellets was investigated and it was found that the uptake capacity of pellets was found to increase with increase in the initial dye concentration, while it was found to be decreasing with increase in pellet dose. Presence of co-ions and change in pH had no effect on the removal capacity. The adsorption isotherm followed the Langmuir model while the adsorption kinetics was well described by the pseudo-second order model. A simple device that can be used in aquariums, made from stainless steel wire mesh containing the ceramic pellets has been described which can slowly yet effectively remove MB from tap water at ultralow concentrations..

Keywords: Clay, aquaculture, methylene blue, ceramic, adsorption, water.

4069

Investigating the Performance of Self-Compacting Concrete Pavement Containing GGBS

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Abstract: The present experimental investigation focused on the effect of ground granulated blast furnace slag (GGBS) on Self-Compacting Concrete (SCC) Pavement. Generally, the pavement requirements are workability, mechanical strength, drying shrinkage, and abrasion resistance, and these are predicted in the present experimental investigation as a function of GGBS percentage. The GGBS of 0% to 60% is partially replaced with cement to accomplish the maximal performance of SCC. From the experimental viewpoint, the workability properties are improved as the percentage of GGBS enhances. Mechanical strength properties like compressive, flexural, and split tensile strength of SCC mixes are improved till 40% if GGBS is introduced in place of cement. It is identified that the percentage of GGBS increases when the drying shrinkage of concrete reduces. For abrasion resistance, the percentage of weight loss is minimal for SCC mixtures as the percentage of GGBS increases. Relationships are established between slump flow (mm) and T50 (sec), similarly the dependence of flexural strength on compressive strength of SCC mixtures are reported for further development of concrete pavements.

Keywords: Concrete pavements; Self-compacting concrete; GGBS; Concrete Mixtures; abrasion resistance;

4071

Dielectric Properties of Steel Melting Shop (SMS) Slag

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Abstract: Many researchers have been focused on the better way to increase the utilization of industrial by-products for the road construction and tile productions. However, none of the research results have reported the functional characteristics of SMS slag. In this paper it deals with the processing and functional characterization of SMS slag using novel powder metallurgy method. The particle sizes, mineralogical phases, and dielectric constant were determined by BET, XRD and Impedance analyzer respectively. The effect of reduction of particle size on the functional properties of SMS slag was revealed that reduction in particles of slag decreases the dielectric properties of slag at 600°C. It is suggested that SMS slag can be useful for the electronic packaging applications.

Keywords: SMS slag, dielectric constant, dielectric loss, XRD analysis.

4075

Trajectory Features and Energy Dissipation of Conventional and Modified (Deflector) Ski-Jump Bucket

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Abstract: Conventional ski-jump bucket energy dissipator is the most important structures used when flow velocity at the spillway foot exceeds 20 m/s. The experimental analysis showed that energy dissipation in conventional ski-jump bucket is less. It is due to fact that, in conventional ski-jump bucket, energy is dissipated partly through the interaction of trajectory with air and mostly through the impact of trajectory in the tail water. To improve energy dissipation, it is proposed to modify conventional ski-jump bucket by use of a deflector along both sides of the bucket. The deflector will contract the flow on both side and promote impact of trajectory in air. So in modified ski-jump bucket, energy is dissipated not only by the interaction of trajectory with air and by the impact of trajectory in tail water but also by the impact of trajectory in the air. In the current study, the effects of using deflector on both sides in the ski-jump bucket were investigated experimentally. This experimental study was based on a comparison of the conventional ski-jump bucket (CSB) with the modified ski-jump bucket (MSB). Model tests were carried out in a hydraulic flume of 30 x 30 cm in cross section and 6 m in length for ten distinct discharges. The model was designed on the basis of the Froude similarity condition with a scale of 1:100. Each test consisted of evaluating the trajectory features and energy dissipation. The main challenge of the present research was to get well trajectory along with more energy dissipation in modified (deflector) ski-jump bucket in comparison with conventional ski-jump bucket. The results demonstrated that modified ski-jump bucket (MSB) improves energy dissipation and also well trajectory was formed. Energy dissipation for the CSB is between 47.16 % to 56.66 %. Energy dissipation for MSB ranged from 67.168% to 72.144%..

Keywords: Ski-jump bucket, Deflector, Trajectory, Energy dissipation, Model test, Hydraulic flume

4080

Comparative Analysis of Drop Impact Resistance for Different Polymer Based Materials Used for Hearing Aid Casing

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Abstract: Hearing disability is commonly observed in old age person. It is observed that for the age limit 55 to 80 years around 40% of individuals are facing age related hearing loss. Light weight hearing aids made of composites are being used very frequently. Generally, 2 types of hearing aids canal; In-the-ear (ITE); Behind-the-ear (BTE) out of which BTE is commonly preferred. Around 38 % of BTE aids fail in their operation due to the impact generated by mishandling. Drop test which measures the impact and fragility of the component. It particularly determines, how the component performs under external the impact of the load. In the present study, drop impact numerical analysis has been carried out using ANSYS workbench explicit dynamic module for hearing aid casing. Three different polymer materials Acrylonitrile butadiene styrene (ABS), Polylactic Acid (PLA) and Thermoplastic Polyurethane (TPU) have been used. The main purpose of the analysis is to determine the maximum deformation and critical area when it falls on the ground. Load conditions like impact velocity and height have been considered as per the IS standard IS: 11052 – 1984 for the flat and side drop test. It is observed that maximum deformations were observed in TPU as compared to PLA and ABS irrespective of velocity. In addition, contact force was observed maximum in PLA and minimum in ABS irrespective of velocity which leads to minimum internal energy for PLA. TPU and ABS could be the second choice of material after PLA for the heading aid casing.

Keywords: Hearing Aid; Drop Test; 3D Printing; FDM.

4083

Comparative Analysis of Drop Impact Resistance for Different Polymer Based Materials Used for Hearing Aid Casing

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Abstract: Hearing disability is commonly observed in old age person. It is observed that for the age limit 55 to 80 years around 40% of individuals are facing age related hearing loss. Light weight hearing aids made of composites are being used very frequently. Generally, 2 types of hearing aids canal; In-the-ear (ITE); Behind-the-ear (BTE) out of which BTE is commonly preferred. Around 38 % of BTE aids fail in their operation due to the impact generated by mishandling. Drop test which measures the impact and fragility of the component. It particularly determines, how the component performs under external the impact of the load. In the present study, drop impact numerical analysis has been carried out using ANSYS workbench explicit dynamic module for hearing aid casing. Three different polymer materials Acrylonitrile butadiene styrene (ABS), Polylactic Acid (PLA) and Thermoplastic Polyurethane (TPU) have been used. The main purpose of the analysis is to determine the maximum deformation and critical area when it falls on the ground. Load conditions like impact velocity and height have been considered as per the IS standard IS: 11052 – 1984 for the flat and side drop test. It is observed that maximum deformations were observed in TPU as compared to PLA and ABS irrespective of velocity. In addition, contact force was observed maximum in PLA and minimum in ABS irrespective of velocity which leads to minimum internal energy for PLA. TPU and ABS could be the second choice of material after PLA for the heading aid casing.

Keywords: Hearing Aid; Drop Test; 3D Printing; FDM.

4093

Stabilization of Soil Nailed Slope by Flexible Materials

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Abstract: The soil slopes alongside the roads, embankments etc. often lead to mishaps as they are prone to slide or collapse due to their instability. Soil nailing is remedial measure to such unstable soil slopes and thus to prevent such mishaps. In this research, a physical model of soil nailed slopes has been established and is tested for stress and strain with different flexible facing materials under the application of load using a hydraulic jack. Then the settlement and displacement of the soil nailed slopes with different facing materials is also calculated and compared. The several flexible facing materials used were HDPE Geomembrane Sheet, Geocomposite and Biaxial Geogrid and were compared with the soil slope without facing. This research shows that different flexible facing materials have different behaviour in terms of strain and displacement under the similar magnitude of load. And it is obtained that flexible facing materials can be a good replacement to rigid facing materials for non-critical structures and an economical and effective way to strengthen existing soil slopes and stabilize them with. Among all flexible materials that used in this research Geocomposite has high strength of 1.23 N/mm^2 and less vertical and horizontal displacement.

Keywords: Soil Nailing; Flexible Materials; Physical Model; Slope Stabilization; Reinforcement of Slopes.

4095

Modelling the Hardened Properties of Steel Fiber Reinforced Concrete using ANN

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Abstract: The hardened properties of concrete are one of the most important parameters when considering the sustainability criteria of buildings. Numerous previous studies have established how the Artificial Neural Network is used as an effective statistical data modelling tool. In this study, the prediction of Elastic modulus and Compressive Strength of steel fiber reinforced concrete have been illustrated with a feed-forward backpropagation neural network structure. 158 datasets are used for modelling of elastic modulus and 140 datasets are used for modelling of Compressive Strength. The developed ANN models were able to predict the data within the range of input parameters considered and were having regression coefficients values of 0.96 and 0.97 respectively. A comparison of actual and predicted values has been performed and the results indicated that the ANN performed better in terms of prediction with minimum deviation from original data.

Keywords: Steel fiber reinforced concrete; ANN; Elastic modulus; Prediction; Compressive Strength.

5018

Tensile Behavior of Pre-Stress Corroded and Post Hydrogen Embrittled Spring Steel

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Abstract: The Stress Corrosion Cracking(SCC) and Hydrogen Embrittlement (HE) are two major degradation phenomena experienced by the spring steel. The consequences of these phenomena have an impact both on the mechanic response, sufficiency, and life of the mechanical system. The susceptibility to premature failure is never the same and is unique for different environment combinations. There will be combined affect these phenomena. Here in this experimental investigation, an attempt is made to understand the tensile behavior of combined treatment. The pre-stressed specimens were corroded and post-treated with the HE process. Traditional tensile testing was used to investigate the combined effect of corrosion and post-treated HE. From the test results, it can interfere that the post hydrogen charged specimen exhibits ductility loss, but recover in the ultimate strength, and increase in yield strength. The dominance of recovery was also shown by an increase in fracture strength and toughness. The scanning electron microscope was used to assess the mechanism and to characterize it.

Keywords: *Keywords: Tensile loading; SCC; HE; anodic dissolution; crack closure; Fractography;*

5021

Experimental Study on the Stability and Flame Characteristics of LPG Flames in O₂/N₂ and O₂/CO₂ Environment

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Abstract: The current energy crisis and the escalating concern over pollution level necessitate the development of various low emission and clean technologies for efficient utilization of fossil fuels. These technologies offer the benefits of using fossil fuels continuously without harming the environment. Oxy fuel combustion technology is one of the promising low emission combustion technologies having an additional advantage of being a better retrofit option compared to other clean technologies. In the present study, the stability and flame characteristics of LPG flame in a tubular burner has been investigated with oxygen as the oxidizing gas and nitrogen or carbon dioxide as the balance gas. The experiments were conducted to study the effect of primary aeration and the effect of balance gas on the stability and flame characteristics of air and oxy flames. The experimental results from the preliminary experiments show that the flame height decreases with increase in primary aeration for both air and oxy cases and the premixed blue zone increases with primary aeration. The flames observed for oxy cases are dull and weak at all equivalence ratio (or primary aeration). The measured axial flame temperature indicated that the temperature of oxy flames is lower than that of the air flames for the same primary aeration. The data obtained from the stability tests show that the oxy flames can withstand relatively lower port velocity than its air counterpart. Therefore, the stable operating range of the given burner design is lower when CO₂ is used as the balance gas. These differences in the stability and flame characteristics is attributed to the difference in the thermo physical properties like molar heat capacity, mass diffusivity and thermal conductivity of the balance gas CO₂ and N₂.

Keywords: partial premixing, flame stability, equivalence ratio, lift off, reaction.

5022

Microwave Assisted Synthesis and Single Crystal XRD Studies of Dibromocobaloxime

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Abstract: The Cobaloxime, $[\text{Co}(\text{C}_4\text{H}_8\text{N}_2\text{O}_2)_2\text{Br}_2]\text{H}_2\text{O}$ was prepared by chemical precipitation technique and also microwave assisted synthesis technique. The Dibromo Cobalt complex thus prepared is characterized using UV-Vis, IR, NMR, and single crystal XRD. The structure of the complex and nature of hydrogen bonding is confirmed by using single crystal XRD analysis. An interesting factor with this structure was both the glyoxime moieties are protonated compared to dichloro cobaloxime. The complexes are inter-linked by hydrogen bonding through water molecules which are present outside. In addition to that there is a H-bonding running between methyl hydrogen of equatorial dimethyl glyoxime and O_3 oxygen of water molecule..

Keywords: Coordination compounds, Cobaloxime, Dibromo Cobalt complexes, Single crystal XRD

5028

Nanocrystalline Ceramic Oxide CaBiNbO_6 – An Optically Active Material

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Abstract: A favourable material for the optoelectronic system, nanocrystalline ceramic oxide CaBiNbO_6 , has been fruitfully prepared by single step auto ignition combustion method. The modified auto ignition combustion method took a vibrant role in synthesizing the nano structured oxide samples. The XRD revealed that, the sample crystallizes in orthorhombic structure without any secondary phase. The crystallite size calculated from the XRD data using the Scherrer formula is found to be 14 nm. TEM image of the as prepared sample shows a spherical morphology with a narrow particle size of nearly 19 nm. The 97 % of theoretical density of the sample with minimum porosity was attained during the sintering at 900 0C. The optical properties of the sample were studied using Ultraviolet visible absorption and Photoluminescence spectroscopy. The optical studies revealed that the material is wide band gap ceramic oxide and the optical band gap is obtained as 3.59 eV. Photoluminescence studies also revealed that the sample is a photoluminescent material with strong emissions in the visible region. The optical properties of the nano structured CaBiNbO_6 makes the sample find various applications in opto-electronic systems.

Keywords: Nanocrystalline ceramic; Structural analysis; Morphological studies; UV Visible studies; Photo-luminescent studies

5032

Performance Assessment of Valve Regulated Lead Acid Battery for E-Bike in Field Test

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Abstract: The Performance of Valve Regulated Lead Acid battery in E-the bike is affected by various operational and topographical parameters like operating temperatures, variation in discharge rates of the vehicle, operation of the vehicle at the different State of Charge, etc. In this paper, of the Valve Regulated Lead Acid batteries of E-bike is evaluated under different driving cycles with various road conditions and climatic conditions. All the driving processes are dividing according to routes, i.e., urban route, gradient route, highway route, rural route, and time of the day, i.e., morning, afternoon, and evening. All the experiments are done with old and new battery set for a thorough study of performance of batteries with different State of Health. The OREVA ALISH E-bike equipped with four numbers of 12V, 25 Ah Valve Regulated Lead Acid batteries is selected for experimentation. The experimental analysis revealed that the climatic conditions, the topology of the region and State of health significantly affect the battery temperature during operating conditions. The results show that a battery temperature increases rapidly during afternoon field tests, going up to 45.4°C when the ambient temperature is 39.7°C. The route pattern significantly affects the energy consumption of E-bike also. The highest energy consumption of 15.05 Wh/km is observed on the gradient route.

Keywords: Valve Regulated Lead Acid batteries; Field test, E-bike; Battery temperature; Ambient temperature.

5033

Development of Pavement Quality Concrete with SCM's, Fibers and Graphite

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Abstract: Concrete is the foremost important material in world. Nevertheless, normal cement concrete has certain shortcomings, which are low flexural strength, and high thermal conductivity. So, to overcome these draw backs admixtures like fly ash, silica fume etc. are used. Further, fibers also significantly participate in reducing the thermal conductivity and improving the flexural strength of concrete. Increasing coarse aggregate content also, decreases the thermal conductivity of concrete, but it reduces the flexural strength. The aim of this study is optimize the aggregate content and make sequential inclusion of mineral admixtures as well as fibers and graphite to enhance the mechanical, Durability and thermal conductivity properties of pavement quality concrete. This studies show that a permissible amount of 55% coarse aggregates could be used along with 10% of silica fume (SF) and 20 % of fly ash (FA) in the presence of 1.5% of steel fibers and 10% of graphite to yield better result in comparison to conventional concrete..

Keywords: Pavement quality concrete, Graphite, Thermal Conductivity, Flexural strength, Silica fume, Fly ash.

5034

Comparative Modal Analysis of Cantilever Beam Made of Biocomposites using Finite Element Analysis

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Abstract: Natural fiber reinforced polymer composites are attracting many scientist and researcher across the world to develop low cost, biodegradable and environmentally friendly materials. Therefore, for the present study a cantilever beam prepared from natural fiber reinforced polymer composite has been selected for the finite element analysis. We have considered nettle/polyester and chicken feather/epoxy composites material for the development of a cantilever beam to analyze the vibration behavior using ANSYS. The modal analysis was carried out to predict the natural frequencies and mode shapes of the beam structure. During the study natural frequencies and mode shapes of the nettle/polyester and chicken feather/epoxy beam structures were compared with each other. It is found from this analytical study that the natural frequencies of nettle/polyester cantilever were more than chicken feather/epoxy. The natural frequency of nettle/polyester and chicken feather/epoxy cantilever beam varies from 30.196 Hz to 1031.7 Hz and 16.371 Hz to 559.84 Hz respectively. These result obtained through modal analysis will be beneficial for engineers and scientists to find safe working condition while developing mechanical and structural member with these composite materials.

Keywords: Natural fiber composites, Modal analysis, Finite element analysis, harmonic analysis.

5040

Experimental Investigation on Strength Properties of High Performance Concrete Produced Using Artificial and Natural Sand

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Abstract: The present investigation deals with comparison of artificial sand and natural sand with respect to strength properties for various grades of high performance concrete (HPC). In this experiment 100 % artificial sand manufactured from crushed stone is used. In addition to that, natural sand from Krishnariver was also used to produce concrete (NSC). From existing literature, it was observed that, many researchers have investigated HPC properties of concrete up to M 65 grade produced using natural sand or partially replaced natural sand by artificial sand. But because of present situation of depletion of natural sand, there is prime need to replace natural sand by some appropriate material as fine aggregate. HPC produced using 100 % artificial sand is still under development. Therefore, in this study, experimental investigation and comparison were carried out for HPC produced using artificial and natural sand. By referring IS code 10262-2019 for concrete mix design, authors produced M 65, M 75, and M 85 grades of HPC. Equal proportion of ingredients were used for artificial and natural sand concrete. Compressive strength, flexure, split tensile for both concretes were compared. Quality of concrete verified using ultrasonic pulse velocity method. Microstructure of concrete was assessed via Scanning Electron microscope (SEM). The results prove that, both these concrete are performing satisfactory in strength and quality. Also, concrete produced using artificial sand was performing successively better than concrete by natural sand. Finally, authors concluded that, using 100% artificial sand and polycarboxylic ether based (PCE) superplasticizer, optimized mix of various grades of concrete, can be successfully prepared. Also, it proves that, artificial sand is best and cheap material in concrete to develop sustainable concrete.

Keywords: HPC, NSC, PCE, Artificial sand, Optimized concrete.

5042

Dependence of Secondary Operations in Power Metallurgy and their Impact on the Electrical Resistivity in MWCNT/Cu Nanocomposites

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Abstract: This study reports the electrical resistivity of multi-wall carbon nanotubes (MWCNT) embedded copper nanocomposites. Copper-based nanocomposites were prepared by the powder metallurgy method with two different secondary operations, (i) hot pressing and (ii) rolling. The MWCNTs doping weight percentage used are 0, 0.25, 0.5, 0.75 and 1 wt. % of Copper (or base material). The four-point probe technique used to measure the electrical resistance of the prepared samples. The experimental results showed that MWCNT reinforcement increases the electrical resistivity of copper. Further, the comparative study proved that rolled specimens resulted in low electrical resistance compared to the hot pressed MWCNT/Cu nanocomposites..

Keywords: Copper nanocomposites; MWCNTs; Powder metallurgy; Hot pressing; Rolling, Electrical resistivity.

5047

Symmetries in the Properties of Mixing of AgCu Liquid Alloys at 1423 K

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Abstract: The quasi-lattice theory based on the joint effect of size ratio and the energetic (or enthalpic) contribution as well as entropic effect has been used to study the concentration dependent thermodynamic and structural properties of AgCu liquid alloys at 1423 K. The symmetries in the thermodynamic properties such as excess free energy of mixing, free energy of mixing, entropy of mixing, heat of mixing and the structural properties like the concentration fluctuations in the long wavelength limit are well explained by the present theoretical model. The theoretical values of short range order parameter explain the segregating nature of AgCu liquid alloys at 1423 K. Further the energy parameter is temperature dependent.

Keywords: Free energy of mixing; activity; Entropy of mixing; Heat of mixing; Concentration fluctuations, Order energy parameter

5045

Combustion Synthesis and Luminescence Characterization of Dy³⁺ Activated Li₂Sr₂Al₂PO₄F₉ Phosphor

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Abstract:

In this paper we have reported synthesis and characterization of Dy³⁺ activated Li₂Sr₂Al₂PO₄F₉ phosphors. The Li₂Sr₂Al₂PO₄F₉: Dy³⁺ phosphor was prepared by combustion synthesis route using urea as the fuel. The phosphor was characterized by X-ray diffraction (XRD), photoluminescence (PL) and Thermoluminescence (TL) measurements. The PL excitation spectrum of Li₂Sr₂Al₂PO₄F₉: Dy phosphors show the excitation peaks ranging from 300 to 400 nm due to 4f→4f transitions of Dy³⁺ ions. PL emission spectrum of Dy³⁺ ion under 348 nm excitation wavelength gives emission peaking at 478 nm (blue) due to ⁴F_{9/2}→⁶H_{15/2} transitions, 571 nm (yellow) emission due to ⁴F_{9/2}→⁶H_{13/2} transitions. The Thermoluminescence properties of prepared phosphor were studied using gamma-rays irradiation of ⁶⁰Co. TL intensity of prepared phosphors of gamma-irradiations was compared with standard CaSO₄: Dy phosphor. It was seen that TL intensity of prepared phosphors is practically comparable with the standard CaSO₄: Dy TLD phosphor. The response curve of prepared phosphor is linear as compared to well known CaSO₄: Dy phosphor. The TL glow curves of Li₂Sr₂Al₂PO₄F₉: Dy sample showed two sets of traps is being activated within the particular temperature..

Keywords: Phosphor, X-ray diffraction (XRD); Photoluminescence (PL); Thermoluminescence (TL)

5053

Incinerated Municipal Solid Waste Bottom Ash Bricks: a Sustainable and Cost-Efficient Building Material

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Abstract: Incineration of Municipal solid waste leads to the generation of bottom ash and fly ash. The applications of fly ash are many, but the bottom ash is usually being disposed of directly to the landfills. The study seeks the application of municipal solid waste incinerated bottom ash in the manufacturing of bricks. Since bottom ash has a high amount of silica, but due to high porosity and less unit weight compared to clay, the direct use of bottom ash is not feasible for brick production. Cement stabilizes the inorganic compounds present in ash and provides the required compressive strength. A series of compressive strength, efflorescence, pH, water absorption, and Ultrasonic pulse velocity tests were performed on eight different mix proportions. OPC 43 grade cement was used to replace 6%, 8%, 10%, 12%, 14%, 16%, 18% and 20% of incinerated bottom ash content by mass. These lightweight bricks fulfill the criteria of minimum water absorption, minimum compressive strength, and the efflorescence was under the required limits. A final cost analysis of these bricks was done with the conventional ones, which confirm that these bricks are equally efficient for the construction industry. The applications of these bricks were less but not limited to a specific use.

Keywords: Bricks; Municipal Solid Waste; Sustainability; Eco-friendly; Incineration; Bottom ash

5046

Experimental Investigation on Strength Properties of High Performance Concrete Produced Using Artificial and Natural Sand

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Abstract: The present investigation deals with comparison of artificial sand and natural sand with respect to strength properties for various grades of high performance concrete (HPC). In this experiment 100 % artificial sand manufactured from crushed stone is used. In addition to that, natural sand from Krishnariver was also used to produce concrete (NSC). From existing literature, it was observed that, many researchers have investigated HPC properties of concrete up to M 65 grade produced using natural sand or partially replaced natural sand by artificial sand. But because of present situation of depletion of natural sand, there is prime need to replace natural sand by some appropriate material as fine aggregate. HPC produced using 100 % artificial sand is still under development. Therefore, in this study, experimental investigation and comparison were carried out for HPC produced using artificial and natural sand. By referring IS code 10262-2019 for concrete mix design, authors produced M 65, M 75, and M 85 grades of HPC. Equal proportion of ingredients were used for artificial and natural sand concrete. Compressive strength, flexure, split tensile for both concretes were compared. Quality of concrete verified using ultrasonic pulse velocity method. Microstructure of concrete was assessed via Scanning Electron microscope (SEM). The results prove that, both these concrete are performing satisfactory in strength and quality. Also, concrete produced using artificial sand was performing successively better than concrete by natural sand. Finally, authors concluded that, using 100% artificial sand and polycarboxylic ether based (PCE) superplasticizer, optimized mix of various grades of concrete, can be successfully prepared. Also, it proves that, artificial sand is best and cheap material in concrete to develop sustainable concrete.

Keywords: HPC, NSC, PCE, Artificial sand, Optimized concrete.

5055

Effect of Elevated Temperature on Stress-Strain Behaviour of Self-Compacting Concrete

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Abstract: Self-Compacting Concrete (SCC) is an emerging building material as it has unique benefits over conventional concrete. SCC is a High-Performance Concrete (HPC) having the filling ability, passing ability and segregation resistance. In addition, SCC does not require vibration. However, to develop SCC, an appropriate mix design has to be carried out following EFNARC guidelines. This paper attempts to develop a design mix proportion for grades of SCC such as M25, M30, M35, and M40. The requirements of fresh SCC are validated with appropriate experiments such as the V-funnel test, J-ring test, and slump flow test. Cube compressive strength of different grades of hardened SCC was validated at 28 and 56 days. The other mechanical properties, such as tensile strength, flexural strength, and modulus of elasticity, were also examined for different grades of SCC, and the test results are reported. Fire-resistance of building materials has to be assessed to ensure the fire safety of humans and infrastructure during the event of fire accidents. Stress-strain curves were developed to characterize the behaviour of different grades of SCC under elevated temperatures. Three stages of elevated temperatures, such as 300, 600, and 900°C with two methods of heating, were considered in this experimental investigation. It was observed that the maximum stress capacity of SCC linearly decreases with respect to the elevated temperature. Also, the peak strain of different grades of SCC increased as the exposure temperature increases. The changes in the ductile property of different grades of SCC are found to be quantitatively evaluated in terms of Energy Absorption Capacity (EAC). The EAC values are found to be decreased when the exposure temperature increases.

Keywords: High strength concrete; Pumice powder; Micro-silica; Compressive strength; Tensile strength; Flexural strength

5056

Environmentally Assisted Fracture behavior of Edge and Corner Notched Spring Steel

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Abstract: The components made out of spring steel are usually subjected to different environmental conditions when in service. The hydrogen embrittlement is one such process which is inevitable for spring steel. The embrittlement will make the material brittle and induce cracks at the edges and corners. In the present experimental investigation it has been focused on the analysis of the behavior of embrittled spring steel with edge and corner cracks, under impact and bending loads. The specimen preparations and experimentations have been carried out according to ASTM standards. The results have revealed that the embrittlement induced side and corner cracks play a vital role in the fracture process of the spring steel. The mechanism of fracture in edge and corner notched samples has been analysed with the aid of scanning electron microscopy. The microscopic observations have shown that the failure in the edge and corner cracked samples is almost catastrophic, and increase in the rate of crack growth in these embrittled samples is highly influenced by the embrittlement induced cracks.

Keywords: Hydrogen Embrittlement, Corner Cracks, Scanning electron Microscopy, Edge Cracks, Impact energy, Bending Strength

5057

Thermodynamic Analysis of Thermochemical Energy Storage System Based on AB₅ Type Hydride Pairs

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Abstract: The present study deals with the performance analysis of thermochemical energy storage system based on four different working pairs, namely LaNi_{4.85}Sn_{0.15}- MmNi_{4.6}Al_{0.4}, LaNi_{4.75}Sn_{0.25}- MmNi_{4.6}Al_{0.4}, LaNi_{4.65}Sn_{0.35}- MmNi_{4.6}Al_{0.4} and LaNi_{4.55}Sn_{0.45}- MmNi_{4.6}Al_{0.4}. The first law and second law performance parameters are considered to evaluate the performance of the energy storage system. The regeneration heat is considered to be available at 50°C for the present analysis. The temperature of heat storage and heat recovery for the four different working pairs are in the range of 93-140°C and 105-165°C respectively. Hence the proposed energy storage system is used to store heat above 100°C. Recovering the stored heat at higher temperature than that of storage is called heat upgradation. Highest degree of heat upgradation is 24°C and it is obtained for the working pair of LaNi_{4.55}Sn_{0.45}- MmNi_{4.6}Al_{0.4}. The theoretical highest energy storage density and COP are 129 kJ/kg and 0.54 respectively, and they are obtained for the working pair of LaNi_{4.65}Sn_{0.35}- MmNi_{4.6}Al_{0.4}. The second analysis shows that the lowest exergy loss and highest second law efficiency are 2.57 kJ and 96.4% respectively, and they are obtained for the working pair of LaNi_{4.75}Sn_{0.25}- MmNi_{4.6}Al_{0.4}. Based on the first law analysis, the working pair, LaNi_{4.65}Sn_{0.35}- MmNi_{4.6}Al_{0.4}, is taken as best pair due its high energy storage density and high COP. Based on the second law analysis, the working pair, LaNi_{4.75}Sn_{0.25}- MmNi_{4.6}Al_{0.4}, is taken as best pair due to its low exergy loss and high second law efficiency. However, suitable working pair need to be selected based on the type of application.

Keywords: Thermochemical energy storage, metal hydride, pressure concentration isotherm (PCI), energy storage density and second law efficiency;

5059

Influence of Fibers Hybridization on the Tensile and Flexural Properties of Hemp/Bagasse Reinforced Poly-lactic Acid (PLA)

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Abstract: In this study, hemp/bagasse/Poly-lactic Acid (PLA) hybrid green composite (GC) materials are fabricating using hemp fiber and bagasse as reinforcement and emulsion of PLA (PL-2000) as a matrix. Material synthesis was carried out by hybridization techniques using variations in the mass fraction of hemp/bagasse fibers (40%: 0%), (30%: 10%), (20%: 20%), (10%: 30%), and (0%: 40%), with the mass fraction of PLA remaining 60%, respectively. The hemp and bagasse fibers surfaces are modify using the alkalization method and the material synthesis using the compression molding method. The GC was characterized using density, tensile, flexural, and swelling. Scanning electron microscopy (SEM) was used to observe the internal morphology of the GC's. The microstructure of the D sample hybrid GC showed better interfacial bonding and the addition of bagasse fiber improve the interfacial strength. It has been concluded the D sample (sample with 10% hemp fiber and 30% bagasse fiber ratio allow obtaining GC with better tensile and flexural properties than the A, B, C, and E samples. The results obtained in this study will be us ed for further comparative study of the hybrid GC with different matrix and citric acid addition.

Keywords: green hybrid composite, density, tensile properties, flexural properties, and swelling.

5061

Influence of the Properties of P-A-Si:H Layer and the Work Function of Front Contact on Silicon Hetero junction Solar Cell Performance

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Abstract: Heterojunction c-Si and hydrogenated amorphous silicon (a-Si:H) devices with intrinsic a-Si:H thin layer, known as HIT solar cells, are promising alternatives to conventional c-Si solar cells for the possibility of higher open circuit voltage, low temperature processing and lower costs. We have studied the influence of the properties of *p*-a-Si:H layer and the work function of the front electrode material on the performance parameters of *n*-c-Si based HIT solar cells using numerical simulation. The findings are further analyzed using energy band diagrams and carrier concentration profiles at the heterointerface of a-Si:H/*n*-c-Si to reveal the underlying charge transport mechanisms.

Keywords: Silicon heterojunction solar cells; photovoltaics; amorphous silicon; HIT solar cells; numerical simulation;

5069

Synthesis and luminescence properties of Ce³⁺ doped (Sr, Ba)₂GeO₄ phosphors

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Abstract: Cerium (Ce³⁺) doped strontium, barium orthogermanate samples are prepared by conventional solid state mixing method. In this process, X-ray powder diffraction (XRD), Field emission scanning electron microscopy (FESEM), Energy-dispersive X-ray spectroscopy (EDAX) and Photoluminescence (PL) measurements are carried out for the synthesized phosphors. The orthorhombic structure is confirmed by X-ray diffraction of the phosphors. EDAX is confirmed that all the elements are present in the compound such as Sr, Ba, Ge, O, and Ce. Photoluminescence studies of Sr₂GeO₄: Ce³⁺ and Ba₂GeO₄: Ce³⁺ phosphors show intense blue emissions at 438 and 429 nm under ultraviolet excitation respectively. These phosphors are ascribed due to the 5d → ²F_{5/2}, ²F_{7/2} electronic transitions of cerium ions. Therefore, these phosphors might be useable in the display devices and lamp industry as blue emitting phosphors.

Keywords: Sr₂GeO₄: Ce³⁺; Ba₂GeO₄: Ce³⁺; XRD; EDS; Photoluminescence

5070

Four-Parameter Model for the Thermodynamic and Microscopic Properties of AlCu Liquid Alloys at 1373K

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Abstract: Four-parameter model has been applied to study the thermodynamic properties like excess free energy of mixing, activity coefficients, activity, excess entropy of mixing, entropy of mixing, heat of mixing and microscopic functions like concentration fluctuations in the long wavelength limit, S_{CC}(0) and short range order parameter, α₁ of compound forming AlCu liquid alloys at 1373K. The theoretical values of the thermodynamic and microscopic functions are found to be in excellent agreement with the experimental values. The present study reveals that AlCu liquid alloy is ordering in nature. Again the model parameters are temperature dependent.

Keywords: AlCu liquid alloys; Four-parameter model; Free energy of mixing; Heat of mixing; Entropy of mixing; Concentration fluctuations

5072

Effect of Injection Timing on the Performance of Ceiba Pentandra Biodiesel Powered Dual Fuel Engine

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Abstract: In the present work, effect injection timing (IT) on the modified dual fuel (DF) engine performance with effective utilization of biodiesel and gaseous fuel combinations is reported. Biodiesel prepared Ceiba pentandra oil called Ceiba pentandra oil methyl ester (CPNTOME) and its B20 blend (CPNTOME B20) are used as pilot injected fuels while the biogas (raw and purified) is used as the inducted fuel in the modified DF engine. Hence, the present research focus on the enhancing of engine performance of DF engine fuelled with liquid and gaseous fuel combinations. Meanwhile, the effect of IT on modified DF engine performance is investigated. Brake thermal efficiency (BTE), carbon monoxide (CO), hydrocarbon (HC) and smoke emissions were found to be less besides higher emissions of NO_x were observed. Combustion parameters such as ignition delay (ID), and peak pressure (PP) are analysed. The DF engine operated on renewable fuel combinations in DF mode can cover the way for partial substitution of fossil fuel along with reduction in greenhouse gas emissions. Advancing the IT improves the DF engine performance and reduces the smoke, CO and NO_x emissions.

Keywords: Ceiba pentandra oil methyl ester (CPNTOME); Biogas; Manifold Induction, Emissions; Peak pressure and ignition delay.

5076

Structural, Optical and Magnetic Properties of Yttrium Aluminium Borate (YAB) Nanomaterial, Prepared by Low Cost Sol-Gel Chemical Method

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Abstract: In this paper, we present synthesis, structural optical and magnetic analysis, of the Yttrium Aluminium Borate (YAB) nanomaterials. YAB materials were synthesized by Sol-gel method. The structural and morphological analysis, carried out by using X-ray diffraction (XRD) shows that crystal structure of YAB is of nanometric size ranging between 16 nm to 26 nm at annealing temperature is above 800 degree. Photoluminescence property shows that YAB gives intense blue light emission in the visible region. Further energy band gap of the were investigated using Tauc plot which was found to be decreased from 1.782 eV to 1.748 eV respectively with increasing annealing temperature from 800°C to 900°C keeping annealing time constant for 2 hrs. This result shows that the band gap is a function of crystallite size and it is very close to energy band gap of GaAs nanomaterial used in the Light Emitting Diode (LED) application, having band energy gap 1.441 eV. Vibrating Sample Magnetometer (VSM) shows the paramagnetic nature of the prepared sample. Coercivity increases while Magnetization and retentivity decreases for YAB nanomaterials for the temperature above 800 degree Celsius. The prepared YAB nanomaterials may be potential candidate for LED and other related application.

Keywords: *Yttrium Aluminum Borate Crystal, Photoluminescence, X-ray Diffraction, Absorption and emission spectra.*

5090

Artificial Neural Network Modelling for Average Surface Roughness in Citrate Stabilised Electroless Nickel Boron Coatings

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Abstract: In this study, electroless nickel boron coatings were developed on Al 7075 aluminium alloy from the citrate stabilised electrolyte bath to investigate the applicability of artificial neural network (ANN) in the prediction of the average surface roughness R_a of the coatings. The process parameters such as concentrations of nickel, reducing agent and stabiliser were considered as the input parameters and R_a was selected as an output parameter. Two different feed forward back propagation neural network (3-10-1 and 3-5-5-1) were constructed and trained using Levenberg-Marquardt (LM) algorithm to predict the R_a . The accuracy of the networks was compared with the predicted the coefficient of determination (R^2) and mean squared error (MSE). The R^2 and MSE of 0.9998 and 6.32E-05 were obtained for 3-5-5-1 against 0.9850 and 6.29 E-04 for 3-10-1 network architecture, which proved that the multi-layer perceptron (3-5-5-1) fits well for the experimental data was presented..

Key words: Aluminium, Electroless, Nickel-boron, surface roughness, prediction, artificial neural network.

5092

Preparation and Characterization of Caprine Bone Derived Mineral Substituted Hydroxyapatite/ Phyllanthus Acidus Extract for Biomedical Applications

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Abstract: Natural (Caprine bone) Hydroxyapatite/Phyllanthus acidus and Gallium substituted Hydroxyapatite/Phyllanthus acidus composite powders were successfully synthesized by thermal decomposition method. The synthesized powders were confirmed function group by FTIR and the phase purity, crystalline size through XRD results. The SEM results show that the size of the Hydroxyapatite powders reduced with the substitution of Gallium in the natural Hydroxyapatite composite which leads to the formation of finer powders and uniform surface morphology. Natural Gallium substituted Hydroxyapatite/Phyllanthus acidus composite were successfully achieved to obtained better morphology. Gallium substituted Hydroxyapatite/Phyllanthus acidus shows better antibacterial activity compare to Hydroxyapatite/Phyllanthus acidus composite.

Keywords: Caprine bone, Thermal decomposition method, Nanocomposite, Antibacterial activity, FTIR, Morphology

7001

Dislocation and Deformation Analysis of Cu-Ni Thin Films during Nanoindentation using Molecular Dynamics Simulation Approach

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Abstract: The dislocation mechanism, common neighbour analysis in Cu-Ni, is analysed by changing the distinctive parameters of indentation. The simulation was completed using LAMMPS simulation software, and for Analysis of the simulated structures, the OVITO software is used. Overall indentation impact and mechanisms are studied with indentation velocity, indenter radius, and Nickel layer thickness. Change in dislocations and common neighbour analysis is studied with parameter changes. The prime objective of this project is to investigate the effect of the nickel nano-coating on the copper substrate, to study the effect of varying indenter size, i.e., the radius of Indenter, and to detect the effect of varying speed of indentation. We can study the deformation behaviour of Cu-Ni thin films during nanoindentation through molecular dynamics simulation studies through this project.

Keywords: Nano-coating, Nanoindentation, hardness, dislocation analysis, molecular dynamics simulation

7002

Experimental Analysis on Roof Construction

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Abstract: Global warming is a harsh reality of today's century. All human and animals are facing challenges for survivals. Sometimes challenges are very big. According to the environment and nature's role all of us make the arrangement for the leaving comfort. Undoubtedly, as the ambient temperature increases, the inside and outside temperature of the building also increases. This increase in the temperature affects the living condition of human being as well as other biota. Those who can afford they can use a mechanical system called as Refrigeration and air conditioning system. The green roof top is an idea where the cost cutting is done in the energy consumption and increases the comfort level of the biota. Thus, the overall objective of the paper is to investigate the impact of green roof on thermal performance for Indian climate. The thermal performance of the green roof over conventional roof has been compared for the results. The temperatures, cooling potential parameters have been compared for the results.

Keywords: Global Warming; GreenRoof; Thermal Performance; Energy; Cooling Potential

7003

3D Concrete Printing Matrix Reinforced with Geogrid

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Abstract: One of the most widely used Construction material is Concrete. The quality of the concrete is highly dependent on the material proportion which in turn depends on the application that it is being used for. In the conventional method, hike in the cost of the project is majorly synonymous to the use of formwork. And this gets added up with a list that includes safety issues, wastage of material, time elapse, space constrain, labour problems, etc. The aforementioned subjects can be made effective with the application of 3D Printing Techniques in Concrete Technology. This Paper targets on optimizing the mortar mix for 3D Printing Concrete with adaptable mineral and chemical admixtures. Use of accelerators reduced the final setting time to 95 minutes from conventional time of 310 minutes. Also the use of fly ash as replacement to sand enhanced the compressive strength to 30 MPa compared to conventional concrete that had 25 MPa. Other durability parameters were also improved compared to control mix.

Keywords: Mortar; admixtures; strength; durability; workability;

7007

Study on Properties of Bio-Bricks

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Abstract: In the age of sustainability, it is necessary to prevent the depletion of natural resources to maintain needs and ecology. So, achieving a bio-brick of modest, satisfactory strength with little to no fossil fuel is the main motive of this study. For this study, bio-mineralization is used as the optimum technique for the synthesis of bio-bricks. It is the process where CaCl₂, urea, and bacteria (*Bacillus Megaterium* and *Bacillus Subtilis*) are converted into CaCO₃. An extensive study has been done at various pH levels (basic, acidic, neutral) and at different temperatures (4, 31, 60°C) with two different kinds of water (lab grade, groundwater) to find the optimum temperature and pH level. Bacteria do precipitate at high temperatures. It is highly active at basic medium and room temperature than in other cases. We concluded this by studying 3 parameters (pH, temperature, and water) in 18 different scenarios with 54 different samples for each bacterium. From this, the desirable mix design to manufacture fly ash bio-bricks and clay bio-bricks have been selected. The compressive strength of both types of bio-bricks is certainly showing better strength and durability than conventional bricks. Water absorption tests, uniformity, size, shape, and efflorescence tests are done to check the various properties of bio-bricks.

Keywords: *Bacillus Megaterium (BM); Bacillus Subtilis (BS); Urea; Calcium Chloride; Bio-Bricks.*

4038

Green Synthesis of ZnO and CuO NPs using *Ficus benghalensis* Leaf Extract and their Comparative Study for Electrode Materials for High Performance Supercapacitor Application

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Abstract: Plant mediated biosynthesis method is greener, low cost, simple, fast and environmental friendly method of nanoparticles (NPs) synthesis. Herein we have used 1ml freshly prepared leaf extract of *Ficus benghalensis* (banyan tree) as capping/stabilizing agent for the synthesis of ZnO and CuO NPs. These synthesized NPs have been characterized by using Scanning electron microscopy (SEM), Energy dispersive spectroscopy (EDS), Powder X-ray diffraction (PXRD) and Fourier transform infrared spectroscopy (FTIR). SEM images of ZnO and CuO NPs show morphological properties of both nanoparticles. EDS, FT-IR and XRD data is used for the structural characterization of nanoparticles. Presence of plant organic compounds on the surface of nanoparticles confirms their capping/stabilizing role in nanoparticles synthesis. The cyclic voltammetry (CV) study has been done for getting specific capacitance (C_s) for supercapacitor application. The obtained values of specific capacitance for ZnO NPs are 6.318 F g^{-1} at 20 mV/s, 4.363 F g^{-1} at 40 mV/s, 3.611 F g^{-1} at 60 mV/s, 3.222 F g^{-1} at 80 mV/s and 2.972 F g^{-1} at 100 mV/s respectively. In the same manner, the obtained values of specific capacitance for CuO NPs are 2.144 F g^{-1} at 20 mV/s, 1.916 F g^{-1} at 40 mV/s, 1.846 F g^{-1} at 60 mV/s, 1.775 F g^{-1} at 80 mV/s and 1.725 F g^{-1} at 100 mV/s respectively. The values of energy density varies in the range from 1.0620 Wh/kg to 0.4996 Wh/kg for ZnO NPs and in the range from 0.1904 Wh/kg to 0.1532 Wh/kg for CuO NPs respectively.

Keywords: ZnO NPs; CuO NPs; Biosynthesis; Cyclic voltammetry(CV); Specific Capacitance (C_s), Energy density(E).

5006

Comparative Study of Various Flexible Facing Materials for Soil Nailed Slopes

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Abstract: As the natural slopes along the roadsides and embankments are not stable due to sliding or collapse, a technique termed “soil nailing” is used to stabilize the natural or man-made slopes. A small scale physical model of soil nailed slope in well-graded sandy soil and inclined at 60° to the horizontal using four number of soil nails is prepared in the laboratory using different flexible materials as flexible facing namely Uniaxial Geogrid, Geo textile fabric, Coirmat, Fine Stainless steel woven wire mesh. The results of these soil nailed slopes with flexible facing materials and the soil nailed slopes with no additional facing are compared. The behavior of these soil nailed slopes is analyzed by applying extra surcharge with the help of a hydraulic jack for load application on the physical model. The strain produced in the inserted soil nails on stress application is determined using a multimeter with the help of the sensors bonded to the each soil nail. Also, the deflection of the soil mass in horizontal and vertical deflection is measured as it is clearly visible from the perplex sheet provided on the outline of the physical model. The stress, horizontal displacement and vertical displacement induced in all the materials is measured and compared. The fine stainless steel wire mesh took the maximum stress of 1.23 N/mm² with minimum displacements and minimum strength of 0.492 N/mm² was possessed by the slope without any facing material. Also, the other flexible materials like uniaxial Geogrid and coirmat possessed good strength and hence can be an effective alternate to strengthen existing or new slopes and provision of flexible facing materials in soil nailing technique further aids in slope stabilization.

Keywords: ZnO NPs; CuO NPs; Biosynthesis; Cyclic voltammetry(CV); Specific Capacitance (C_s), Energy density(E).

5082

Structural and Electrical Investigation of ‘Bi’ doped SmFeO₃-BaTiO₃ Perovskite System

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Abstract: The polycrystalline ceramic (Sm_{0.75}Bi_{0.25}FeO₃)_{0.5}(BaTiO₃)_{0.5} (SF-BT) is synthesized by high temperature solid state reaction method. The sample is investigated for its multifunctionality by analyzing its structural and electrical properties. The XRD pattern confirms the single phase compound in the tetragonal symmetry. Complex impedance studies confirm the grain contribution to the electrical properties in the material. The relaxation mechanism in the sample is due to the short-range mobility of charge carriers.

Key words: XRD; Impedance; AC Conductivity.

5085

Studies on Usage of Natural Fibers and Eco Sand for Sustainable Concreting

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Abstract: Modern construction materials need to have high strength and durability due to the loads that it may experience during its life cycle, also rigorous norms set by standardising agencies make it mandatory. Concrete is a brittle material that is having less tensile strength but its used in many tensile members including beams which demands some amount of tensile strength to be incorporated into it. Also demand for concrete production is steadily raising and its becoming numero uno due to its versatility, yet it needs modification to suit the need and demand. Incorporating fibers into the concrete is being practiced in field and also studied in research by bountiful researchers, in this work a combination of a natural fiber(Sisal) and a manmade fiber (polypropylene) is used in various compositions to increase the tensile strength and to reduce brittleness of concrete. Studies were conducted to identify the variation of strength with and without fiber is done in terms of compressive, flexure and split tensile strength. Promising results were obtained by using the combination of fibers and around 150-200% strength increase is obtained in tensile strength and 50% increase in compressive strength. Multiple ratios such as 0.5:1.5,1:1,1.5:0.5 is added in concrete and fine aggregate is replaced with eco sand which is a silica based sand obtained from cement industry as waste material. The whole combination of this composite is eco-friendly and uses waste materials to increase the strength and durability of concrete.

Key Words: Sisal fiber, Polypropylene fiber, Eco-Sand, Compressive strength , Tensile strength , Flexural strength.

7005

Experimental Study on Light Weight Panel using Phosphogypsum

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Abstract: Recent splurge in the civil engineering industry is fuelled by the growth of industrial clusters across nation and also by conversion of villages into towns and cities. The technological developments and changes are results of industrial growth which resulted in tremendous use of natural resources as a raw material and mass production of manufacturing goods. The development of new technologies and their use in industry also effected the non-industrial sectors. Agriculture sector is also influenced by the industrial growth, with the advent of newer processing technologies it grown manifold. Surging population had put thrust on more production of agricultural produce, the production ended up only with huge amount of waste materials and by products. Among those materials Phosphate is one valuable material which is a nutrient that is very essential for the survival of plants and animal, this is derived from Phosphate rock. Phosphate rock is converted into fertilizer through industrial process, and it is being used widely for agricultural purpose. Also, phosphate is used in many products that produces wastes including phosphogypsum which is generated as waste from phosphate industry. This waste is discharged in sea, rivers and other water courses which has huge adverse effects on ecological system and human life. Much research is carried out to reuse the waste products for making sustainable goods and reduce the problem of disposal. In construction industry, phosphogypsum can be used in concrete. In this work, an attempt is made to utilise waste phosphogypsum in concrete that is widely used construction material to produce light weight panels for industrial and residential purpose. Thrust is given to understand the strength and durability characters of the produced composite so that its industrial usage can be defined. Promising results were obtained with decent increasing in strength and durability which shows that the material can be used effectively in Civil engineering industry.

Key Words: Phosphogypsum, fly ash, glass fibre, Compressive Strength, Flexural strength, Industrial waste.

7006

Utilization of Plastic Waste and Prosopis Juliflora Ash in Making Floor Tiles

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Abstract: Plastic bottles are a large part of the increasing population in the 1940s. It takes hundreds of years for petro-chemical based compounds to decompose. The process of dumping plastic waste is a huge problem and also harmful to the environment. Plastic products are one of the major sources of pollution for land and water. Dumping of plastic waste is a critical problem. To overcome these effects, solid waste management can be used in the construction area. By placing the cement with Prosopis Juliflora ash the side effects caused by cement can be reduced. Solid waste such as crushed plastic and Prosopis Juliflora Ash (PJA) can be used in concrete production. Prosopis Juliflora, a persistent weed that has spread widely over the past 150 years, has been an environmental issue in various parts of the world, including India. Because of its environmental and economic effects, in Africa and India, Prosopis Juliflora has been confirmed as a deleterious plant. It can fix large quantities of carbon dioxide as biomass from the atmosphere, it can be viewed as a smart source of biomass. By replacing the cement with Prosopis Juliflora Ash the side effects of cement towards the environment can also reduce. In this research, the white cement, plastic, and PJA are used to make a floor tile. The primary binder cement is replaced in this study by plastic waste and PJA with 10%, 20% and 30% proportion. In this study, mechanical properties of concrete with and without addition of PJA is studied as per Indian Standard code provisions. It has been observed that these combinations prove good for abrasion and impact resistance of floor tiles made from these, but do not contribute much to strength gain.

Key Words: Plastic, Prosopis Juliflora Ash, Compressive Strength, Abrasion test, Impact resistance, Plastic pollution.

7008

Experimental Study of Single Bed Prototype adsorption Refrigeration Unit Using Waste Heat Energy

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Abstract: Adsorption refrigeration has more potential to become an attractive technology due to use of low-grade thermal energy and environmentally friendly refrigerants. Ammonia-activated charcoal pair based prototype of single bed adsorption cooling system was presented and tested. The most extreme measure of adsorption capacity of ammonia was found to be 0.22 kg/kg of activated charcoal, in shell and tube type adsorption bed respectively. This experimentation indicates that the cooling limit ranges from of 46.38 to 50.67 watt, and thus the results show that it achieves a COP of 0.0971 during a 62-minute total working cycle time under the condition of the temperature of hot fluid 120°C, cooling fluid provided at the temperature of 30°C, adsorption bed temperature of 40°C and working pressure range up to 16 bar. The results have been represented by graphical relations. This unit of adsorption cooling is environment-friendly and has zero ozone depletion potential. The result indicated that the adsorption refrigeration system works effectively and is a better alternative to replacement for traditional refrigeration systems and the concept of a waste heat driven adsorption cooling system can be applied in the small cold storages.

Keywords: Adsorption refrigeration, Activated charcoal-ammonia working pair, Adsorption bed, Low-grade heat source. COP.