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Preface

PREFACE

This is a proceeding of the 3rd International Conference on Engineering for Sustainable World (ICESW).

ICESW brings together international experts, scholars, policy makers, industrialists, etc to discuss contemporary and cutting-edge research in engineering management, innovation, energy development and clean technology. It also provides a golden opportunity to meet experts and develop new collaborations on the fundamentals, applications and products from various fields such as: sustainable energy, sustainable cities, engineering innovations, clean technology/production, sustainable materials and engineering, mechatronics, renewable energy systems etc. The conference strives to foster new collaborative and interdisciplinary relationships among emerging and established engineers, scientists, and policy makers.

ICESW' topics are built on the fundamentals of sustainability, with vigorous attention to all forms of engineering professions and enabling research tools including the following topics.

• Renewable Energy and Sustainability • Engineering Innovations • Sustainable Manufacturing Systems and Techniques • Modelling and Simulations • Clean Technology • Local Contents in Manufacturing • Chemistry and Physics of Material • Sustainable Materials and Processing • Engineering Policies and Education for Sustainable Development • Mechatronics • Thermal Engineering • Sustainable Buildings and Cities • Sustainable Product Design and Development • Eco-Industrial Parks • Industrial and Production Engineering

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OPEN ACCESS 011002

Peer review statement

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All papers published in this volume of *Journal of Physics: Conference Series* have been peer reviewed through processes administered by the proceedings Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

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Papers

Response surface methodology (RSM) and artificial neural network (ANN) on modeling and optimization of corrosion inhibition efficiencies of mild steel using water hyacinth as an inhibitor was carried out in this work. The optimization of the process was done using generic algorithm (GA) and RSM which were subsequently compared. The optimum inhibition efficiency predicted were 87.675924% and 82.89% by ANN and RSM respectively. The value of R^2 obtained were 0.9695 and 0.85118 for ANN and RSM models respectively while RMSE values of 3.90 and 4.3089 were gotten for RSM and ANN models respectively. The model regression indicated that RSM best fit the experimental data thus perform better on mild steel corrosion inhibition.

https://doi.org/10.1088/1742-6596/1378/2/022002

OPEN ACCESS 022003

Characterization of a Finned Heat Sink for a Power Inverter

F. Onoroh, O. O. Adewumi and M. Ogbonnaya

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Heat is a by-product which is constantly being generated in the operation of a power inverter and if left unchecked will inevitably lead to the damage of the device. Hence a means to efficiently dissipate this heat has to be employed. In this research, a heat sink is mathematically modelled and its thermal performance was evaluated using ANSYS software and experimentally validated. The optimisation of the heat sink was done with the aid of the FMINCON optimization tool in MATLAB. A K-type thermocouple and a three channel temperature logger, MTM-380SD, with real time data logger were used to obtain temperature data of the heat sink for the purpose of experimental validation. The optimized heat sink parameters are heat sink length and width, number of fins, base thickness, fin height, thickness and spacing. Results show that the percentage deviation between the simulation and experimental temperature results for a pulse load of 300W is 8%, for a pulse load of 460W is 3%, for a pulse load of 600W is 8%, for a pulse load of 1015W is 2%. The maximum simulated and experimented temperatures are 84°C and 85.4°C. Thus the inverter can be safely and reliably operated.

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OPEN ACCESS 022004

Detection of Sigatoka Disease in Plantain Using IoT and Machine Learning Techniques

F. O. Sweetwilliams, V. O. Matthews, E. Adetiba, D. T. Babalola and V. Akande

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Achieving United Nations Sustainable Development Goal 2 (UN SDG2) infers an imperative to urgently increase food production by up to 70%. However, concerns have risen that increases in food production have not kept pace with increase in world population, which is estimated to reach 10 billion people by the year 2050. In this paper, an IoT with machine learning based system was developed to acquire and process significant indicators such as temperature, moisture, humidity and leave images for the detection of Sigatoka disease in plantain. Appropriate sensors for detecting the stated disease indicators were interfaced with Raspberry Pi3 microcontroller module to collate and transmit the sensor data wirelessly to ThingSpeak, which is the selected cloud based IoT platform. The acquired leave images were further processed using two image descriptors, namely: Scalable Color Descriptor (SCD) and Histogram of Oriented Gradient (HOG) to extract discriminative color

and texture features respectively. The features were then classified to detect the diseased or non-diseased class using Multilayer PerceptronArtificial Neural Network (MLP-ANN). The best accuracy of 98% was produced using the HOG descriptor.

https://doi.org/10.1088/1742-6596/1378/2/022004

OPEN ACCESS 022005

Development of a Small-Scale Vertical Axis Wind Turbine for Generation of Compressed Air for Pneumatic Systems

A. O. Adeodu, I. A. Daniyan, O. R. Raji, K. A. Bello and O. R. Oloyede

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This work presents the development of a cost effective vertical axis wind turbine for generation of compressed air using locally sourced materials. The design of the wind turbine takes into consideration the reduction in the weight and size of the turbine thereby lowering production and installation costs. This increases the efficiency by increasing the resistance from dynamic loads and reduction of acoustic noise discharge. The following locally sourced materials were employed for the development of the wind turbine compressed air system: acrylonitrile butadiene styrene, teflon, polyethylene terephthalate, mild steel, rubber and wood filings. The blade design is of the form airfoil shape of NACA 2412 type typical of air crafts wings with a chord of 50 mm and utmost camber of 2% sited 40% (0.4 chords) from the leading edge and utmost thickness of 12% of the chord. The aerodynamic properties include angle of attack which is 2.2° and the utmost twist angle which is 25.66°. From the performance evaluation, maximum tip speed ratio of 0.9 was achieved as well as power output generation of approximately 14 watt at 10.2 m/s wind speed. The findings of this project identify compressed air energy storage as a viable alternative to chemical energy storage generated from wind turbines. The developed turbine will contribute significantly to the effective conversion of wind kinetic energy into pressure energy as opposed to electrical.

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OPEN ACCESS 022006

Corrosion propagation challenges of mild steel in industrial operations and response to problem definition

Ojo Sunday Isaac Fayomi and Abimbola Patricia Idowu Popoola

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The continuous use of mild steel in major industrial operations is ever uprising due to many engineering factor in materials selection. This mini review gives a cogent corrosion perspective of mild steel, its problem definition and responses for safety and technological progress purposes.

https://doi.org/10.1088/1742-6596/1378/2/022006

OPEN ACCESS 022007

Surface protection progresses: A paradigm shift on composite deposition and matrixes

Ojo Sunday Isaac Fayomi and Abimbola Patricia Idowu Popoola

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In searching for solutions to minimize the challenge of metallic corrosion, surface treatment becomes profitable tool. Electrochemical deposition has, over recent decades, evolved from an art to an exact science. This development is seen to be responsible for the ever-increasing number and widening types of applications of this branch of practical science and engineering. Composite and nanocomposite alloys have been the focus of interest for many manufacturing systems, a great curiosity started with automobile industry, food industry, aeronautic and aerospace industries, where the weight to density fraction was of necessity. This paper seeks to unveil deposition novel engineering materials and technology by various author.

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OPEN ACCESS 022008

Physico-Mechanical Characterisation of Fuel Briquettes made from Blends of Corncob and Rice Husk

H. A. Ajimotokan, S. E. Ibitoye, J. K. Odusote, O. A. Adesoye and P. O. Omoniyi

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Densification of agricultural residues such as husks, shells and cobs into fuel briquettes is an alternative renewable feedstock for producing solid fuels because it improves their physico-mechanical, storage and combustion properties. This paper presents the physico-mechanical characterisation of fuel briquettes made from blends of corncob and rice husk. The raw samples of corncob and rice husk were collected, sorted and pulverised. The pulverised samples were screened to 0.25, 1.0 and 1.75 mm particle sizes, blended at mixing ratios of 80:20, 70:30, 60:40, and 50:50, and afterwards, briquette samples were produced at 25, 50, and 65 kPa compaction pressures respectively with starch as the binder. The variations in the particle size, mixing ratio and compaction pressure have significantly influenced the investigated physico-mechanical properties of the produced briquettes. The briquette made from 80:20 mixing ratio of corncob to rice husk, 0.25 mm particle size and 65 kPa compaction pressure had the highest compressive strength of 111 kN/m^2 and the least compressive strength of 39 kN/m^2 from briquette with 50:50 ratio of corncob to rice husk, 1.75 mm particle size and 25 kPa compaction pressure. The briquette made from 50:50 mixing ratio of corncob to rice husk, 0.25 mm particle size and 65 kPa compaction pressure spent the longest time to collapse when immersed in water; taking up to 972 seconds and the least time of 480 seconds from briquette with 80:20 mixing ratio corncob to rice husk, 1.75 mm particle size and 25 kPa compaction pressure.

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OPEN ACCESS 022009

Indoor Radon Concentration Survey in Bank Basements in Three Nigerian Cities

I. K. Adegun, B. E. Anyaegbuna and O. A. Olayemi

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Basement workplaces are considered as confined environment with challenging indoor air quality having higher than normal pollutants particularly that of soil gas origin. Radon a major soil gas infiltrates and accumulates within indoor spaces and becomes harmful in the absence of natural or mechanical ventilation. Radon level in bank basements in Ilorin, Lagos and Akure have been sampled and analysed in this study. The paper presents the investigations conducted to measure the radon concentration in the occupied basement component of the bank buildings. Most workers in

basements are unaware of radon, and there is limited documented research on its health hazards in Nigeria. The survey parameters were radon concentrations, floor levels, geographical locations and the influence of atmospheric conditions. Corentium monitor, a continuous, digital radon monitor, in addition to, temperature meters and Prologue wireless weather station were used for the experiment. The result showed an indoor radon concentration and effective doses annual mean values of 23 Bq/m3 and 0.0896mSy/y respectively in the occupied basements.

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OPEN ACCESS 022010

Evaluation of Updated Volume-translation Peng-Robinson Model for Estimating Volumetric Properties of Hydrocarbon Mixtures at High Pressure High Temperature

K. B. Orodu and O. D. Orodu

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A volume-translation function by the authors with arguments of reduced pressure and temperature was assessed for binary and multicomponent mixtures. The correlation is not a generalised function and reduced-pressure as an argument. Thereby, ensuring high performance at high pressure and temperature (HPHT) in the class of other volume-translation function for cubic equations of state. The function was compared to non-cubic equations of states (nCEoS) of PC-SAFT, GERG-2004, GERG-2008 and AGA8-DC92 for the prediction of molar-volume at HPHT with reasonable results.

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OPEN ACCESS 022011

Development Of An Improved Pepper Grinding Machine Using Stainless Steel

B.M Edun, Noiki Ayodele and S.A Afolalu

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A prototype of a new improved pepper grinding machine was designed using locally available materials to solve the problem of metal contamination, corrosion effect from machine parts and the manual means of applying water among other problems associated with the conventional pepper grinding machines that are used in Nigeria. It is designed to reduce noise pollution and to enhance the hygienic processing of pepper as well as individual entrepreneur for rendering milling services in the neighborhood and market place thereby creating employment for Nigerians. Food crops like tomatoes, cowpeas, maize and soybeans can also be milled using the machine. The machine consists of a hopper, water tank, 2hp electric motor, frame, shaft, bearing, grinding plate, the driving and driven pullets, v- belt, water sprinkler, discharge chute and water tap. The peppers are meant to be loaded into the hopper and to be collected through the discharge chute. The water from the water tank is being regulated by the tap and sprinkled on the pepper through the perforated pipe at interval depending on the speed of the machine. The average grinding capacity and grinding efficiency were determined as 2kg, 3kg, 4kg, 5kg, 6kg and 85% respectively. There was a significant difference ($p< 0.05$) between the grinding capacity and efficiency of the machine with water sprinkler and that of manual watering. The grinding capacity and efficiency of the machine with water sprinkler was higher when compared to the grinding capacity and efficiency of manual watering. The machine was observed to perform effectively and therefore, recommended for domestic and commercial use by the grinders in the market place.

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OPEN ACCESS 022012

The Effects of Heat Generation on Cutting Tool and Machined Workpiece

T.S. Ogedengbe, A. P. Okediji, A. A. Yussouf, O. A. Aderoba, O. A. Abiola, I. O. Alabi and O. I. Alonge

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Metal cutting processes usually cause heat generation at the cutting zone (around the workpiece-tool intersection). The heat generated during these processes may cause different effects on both the workpiece and tool, this in turn may affect the finished product and the general performance of the machined piece. In this study, a review was done on various types of machining conditions available, effects of heat generated on the workpiece and tool, and the approaches adopted to reduce this heat at cutting zones. This study also focuses on the simulation of percentage ratio of heat removal. To handle the simulation, various approaches of heat removal methods were used to get the percentage ratio using the ansys version 19.1 software. It was discovered that heat generation causes two major types of wear on the tool, crater and flank wear, resulting in the reduction of cutting tool life as well as dimensional inaccuracy, surface damage and severe corrosion cases on the workpiece. Various heat reduction methods and coolant application types were as well studied and their merits and demerits were discussed.

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OPEN ACCESS 022013

Synthesis and characterization of PSF/PES composite membranes for use in oily wastewater treatment

M.S Rameetse, O.A Aberefa and M.O Daramola

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Environmental sustainability requires development of environmentally benign and energy efficient technology for treatment and disposal of wastewater. Membrane technology has emerged as a highly viable method for water treatment throughout the years. However, their limited commercial application has prompted a lot of researchers to explore different approaches to modify the membranes to enhance their performance. Polymer blending is one of the modifying techniques currently being explored to develop materials with unique anticipated properties depending on the type of membrane needed. This technique has shown improvement in the quality of the membrane by enhancing the mechanical strength as well as the performance of the membrane. In this study, blended polysulfone (PSF) and polyethersulfone (PES) membranes were synthesized at different PSF:PES ratios (100%:0%, 0%:100%, 50%:50%, 80%:20%, 20%:80% and 25%:75%) using N-Methyl-2-pyrrolidone (NMP) as a solvent via the phase inversion method. The quality and integrity of the membranes were checked via Scanning electron microscopy (for morphology); Thermogravimetric analysis (for thermal stability), Atomic force microscopy (for surface nature) and nanotensile measurement for mechanical strength. The flux, % rejection and porosity as the performance criteria of membranes showed a massive improvement in majority of the blended membranes than in pure PES and PSF membranes. AFM images indicated lower roughness in the pure PSF membrane as compared to the blended membranes. The tensile strength only improved on the 25%:75% membrane

while the elasticity increased with an increase in PES concentration in the blended membranes. These results demonstrate the diversity of blending polymeric membranes to modify specific properties for desired function and highlight the possibility of more commercial application.

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OPEN ACCESS 022014

The Impact Of Technological Innovation On Production

O. S. I. Fayomi, J.O Adelakun and K.O. Babaremu

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Technological Innovation which implies the development of new thoughts, items, administrations, and procedures that will improve technology solutions has provided a better lifestyle by improving the standard of living in the area of production. Due to the rapid developments made by humankind in terms of scientific and technological innovations, which signaled the industrial revolution, and growth of mega-industries across the turn of 20th century which although lead to an increase in standard of living, coupled with an unprecedented economic growth rate and a rapid increase in population growth rate around the world, has led humanity to stretch and put serious strain on the natural resources and environmental limits of the earth. The deficiencies in production has gradually been combated but it was discovered that innovation from technological bearing has played a significant role in the productivity outcomes of most production processes. This paper focuses on brief views on technological innovation and the impact of construction technology, agriculture technology, biotechnology, nanotechnology and health biotechnology on production

https://doi.org/10.1088/1742-6596/1378/2/022014

OPEN ACCESS 022015

Chemical Modification of *Urena lobata* (Caeser Weed) Fibers for Reinforcement Applications

C. E. Njoku, J. A. Omotoyinbo, K. K. Alaneme and M. O. Daramola

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The reinforcements of composites with natural fibers have attracted more concerns than their synthetic counterparts due to the biodegradability, less-expensiveness, CO_2 neutrality, ready availability, non-abrasiveness, low weight, renewability and high specific mechanical properties of these fibers. However, the hydrophilicity, reduced interfacial bond, and reduced thermal strength of fibers of natural origin deter their attraction for use in composites reinforced with natural fibers. The treatment of naturally-occurring fibers chemically helps to clean up the fiber surface making them rougher; reduces moisture absorption; and increases fiber-matrix adhesion. In this study, *Urena lobata* fibers produced by natural water retting for use as composite reinforcements were subjected to alkaline-treatment with sodium hydroxide solutions at varying concentrations. The transformations that occurred in the structures and morphologies of the fibers were checked using scanning electron microscopy (SEM). Tests were done on several bundles of the *Urena lobata* fibers so as to understand how the chemical treatments had effects on the tensile behaviours of the fibers. The results obtained reveal enhanced mechanical behaviours of the treated *Urena lobata* fibers in comparison to the

untreated ones. Interestingly, the chemical treatment with 6 wt% NaOH solution yielded the best mechanical behaviours (2.91 ± 0.01%, 53.26 ± 0.01 GPa and 2611.34 ± 0.045 MPa for ductility, elastic modulus and tensile strength, respectively) amongst other alkaline-treated fibers.

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OPEN ACCESS 022016

Disaster Management: A Perspective From Production Processes

O. S. I. Fayomi, K.O. Babaremu and J.O Adelakun

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In most production and manufacturing industries, the occurrence of disasters during production processes it worthy of note. Production takes place regularly on a daily basis via various processes that makes up for a complete production chain. These processes are often not well followed, hence leading to disasters. These disasters lead to a lot of damage in the industry as well as losses, sometimes, death occurs. The occurrence of these disasters could be as a result of accident, negligence or incompetence. There are other surrounding factors too. This paper is to focus on an overview of disaster related to production process. The attributes include: Disaster Management Function (prevention and mitigation), Time of disaster (before, during and after), Type of Disaster (accidents, fire). This paper under the mitigation area, describes the collaboration of Higher Education with the industry in educating workers and firms involved in production concerning the importance of disaster management. It is a field of study that should never be overlooked by any firm into production processes.

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OPEN ACCESS 022017

Performance Evaluation of Abia Clay with Natural Polymers in Water-Based Drilling Fluid Development

M. O Jimoh, T. O. Salawudeen, A. O. Arinkoola and M. O. Daramola

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The quest for local content in the oil and gas industry for sustainability of materials and resources has necessitated further research on the use of Nigerian clays and locally sourced materials as additives in drilling fluid formulation to substitute the imported bentonite and synthetic additives currently used in natural oil and gas exploration. In this study, Uturu clay was treated using NaOH, $NaHCO_3$, KOH and $NaCO_3$ to improve its suitability for drilling fluid formulation. The clay sample was characterized using particle size analyzer (for particle size distribution), X-ray diffraction (for purity and crystallographic patterns), Fourier Transform infrared for surface chemistry. Water-based drilling fluid was developed using the characterized Uturu clay as the main composition and other four locally source natural polymer namely cassava starch, breadfruit starch, bush mango seed and corn fibre as rheology modifiers. It was found that clay treatment did not have significant effect on spud mud rheology. Clay characterization reveals that the untreated clay consists mainly of montmorillonite with traces of kaolinite and quartz. Preliminary drilling fluid formulation shows that rheological properties were significantly improved with the addition of the natural polymers. In addition, the rheological data were best described using power law model. Further optimization study

is required to achieve optimum formulation comparable to the American Petroleum Institute recommendations and this investigation is ongoing in our lab and results will be communicated in another article.

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OPEN ACCESS 022018

Synthesis of Optimal Heat Exchanger Networks with Quantified Uncertainties and Non-isothermal Mixing

K.O. Yoro, A.J. Isafiade and M.O. Daramola

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The primary objective of this study is to develop a simultaneous approach for the synthesis of flexible heat exchanger networks (HENs) with non-isothermal mixing assumptions. The HENs synthesis procedure presented in this study took into consideration quantified uncertainties in inlet temperatures and flow rates with an unpredictable time of shift. The proposed multi-period MINLP model was used to generate a HEN with optimized heat exchanger areas and total annualized costs attributed to utility duties. A framework for generating the flexible HEN over a specified range of variations in flow rates and stream temperature was proposed in this study. The framework was based on a two-stage strategy; a HEN design stage was first performed before the testing stage where the energy-saving potential of the synthesized HEN was established. The effectiveness of the proposed approach was tested for energy minimization using a case study in literature with variation in inlet temperature and flow rate. It was observed that the inclusion of non-isothermal parameters in the non-linear model resulted in a HEN that optimally works under fluctuating conditions without losing stream temperature targets while maintaining economically-optimal energy integration.

https://doi.org/10.1088/1742-6596/1378/2/022018

OPEN ACCESS 022019

Production of CNT Yarns from Methane Gas for Use as Filaments in Incandescent Bulbs: Thermodynamic Properties of As-spun CNT Yarns

N. Mahagani, E. Igbokwe, O. Aberefa, V. Bodiba, M.O. Daramola and S. E. Iyuke

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Energy efficiency is a minimal cost energy resource. It is critical in bridging the gap via reducing overall demand, allowing electricity supply to be expanded to meet increasing demand in a timely and sustainable way. Incandescent bulbs with tungsten filaments convert only about 10% of the input energy into light with the rest wasted as heat and resultant carbon dioxide gas emissions. This results in high energy and environmental inefficiency. Carbon nanotubes (CNT) yarns as filaments for replacement of tungsten in incandescent bulbs represent an economic option boosting high energy and environmental efficiency. In this study, CNT yarns were produced from methane, an abundant greenhouse gas currently flared in Africa. Synthesis of CNT yarns were carried out in a Floating Catalyst Chemical Vapour Deposition (FCCVD) reactor using ferrocene as the catalyst with direct spinning of CNT into yarn. The quality and morphology of the produced yarns at different temperatures (900 – 1000°C) were determined using Scanning Electron Microscope (SEM) and Raman Spectroscopy. The optimum temperature to produce CNT yarns was found to be at reactor temperature of 950°C. The thermodynamics associated with the production of the as-spun CNT

yarns were determined by Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC). Heat capacity of CNT yarns was calculated based on the measured heat flow at thermal stable state. A polynomial regression of the form: $Cp=0.002T^2 – 0.4512T+66.099$ was proposed for the prediction of the thermodynamic values. Change in thermodynamic quantities of yarn such as entropy and enthalpy were determined based on the heat capacities calculated from fitted polynomial models using relationship of thermodynamic function.

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OPEN ACCESS 022020

Thermo-decompositional Analysis of Sawdust Blends of Invasive Alien Plants

N.M. Okoro, K.G. Harding and M.O. Daramola

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This study examined the effect of blending two invasive wood species of distinct physical and chemical properties, maximum char yields and rates of decomposition, on their thermal behaviour towards sustainable production of energy. To evaluate their potential use for production of briquettes/pellets, an examination of the dynamic thermogravimetry of sawdust blends of bugweed, a low density, fast-growing fibrous invasive shrub with eucalyptus wood was conducted. Individual blends in ratios of 50:50 (BUG50), 30:70 (BUG30) and 70:30 (BUG70) were tested under a pyrolysis condition and also in oxidized atmosphere to examine their combustion behaviours at a constant heating rate. Results were compared to individual results of 100% bugweed sawdust (BUG100) and 100% eucalyptus sawdust (BUG0) as control. The pyrolysis test on the blended samples reveal an increase in maximum char mass yield of up to 17% from that observed in BUG100. Meanwhile, amongst all blends, BUG70 exhibited the least maximum char yield of 34.9% and the highest ash residue of 4.3%. The high ash residue in BUG70 was believed to distort its char combustion. The lowest maximum peak rate of volatilization achieved amongst all blends was 6.6%/min by BUG50 and that of the char decomposition was as low as 2%/min for BUG30. Remarkably, the peak and final decomposition temperatures of all three blends occurred at higher temperatures than those of BUG100, in the pyrolysis test. Results of their combustion tests conducted, reveal thermograms with profiles similar to those observed during the pyrolysis tests. However, there was a general decrease in the peak and final combustion temperatures from those observed during the pyrolysis test of the samples. BUG30 exhibited good char combustion stability across a wide temperature range and at higher combustion temperatures than BUG50 and BUG70. No significant differences were observed in the heating values of all samples tested.

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OPEN ACCESS 022021

Prediction of Emissions and Profits from a Biomass, Tyre, and Coal Fired Co-Gasification CHP Plant Using Artificial Neural Network: Nigerian and South African Perspectives

M. Ozonoh, T.C. Aniokete, B. O. Oboirien, B.C. Udeh, K.O. Yoro and M.O. Daramola

− Hide abstract PDF

The local sourcing of feedstock for energy generation will reduce costs in the power plant, and promote energy sustainability. Most times, potential investors in this area show interest about understanding the profitability of the business because, the information boosts the confidence of the

investors in the project, and gives them the opportunity of making a short and long term plans about the business. The emissions arising from the energy plant is an important aspect of the venture that requires proper attention, otherwise the costs of emission control may consume a greater part of the profit, hence rendering the business un-viable. Nigeria and South Africa (SA) have abundant biomass (e.g. corn cob, sugarcane bagasse, & pine saw dust) coal and tyre that can be used as fuel in an energy plant. A 10 MW CHP plant was fired with coal and biomass, and tyre obtained from Nigeria and South Africa (SA) respectively, at ratios of 1:1, 3:2, and 4:1 to study the emissions and profits in the plant. An empirical model was employed to estimate the annual amount of feedstock and feed rate required for the plant, after which, an artificial neural network (ANN); Levenberg-Marquardt algorithm was used to predict the emissions and profits in the plant for 20-year-investment period with feedstock costing (WFC) and without feedstock costing (WOFC). The profit obtained from the South African feedstock, WFC and WOFC; produced about 45.18 % and 36.83 % ($3, 900, 000.07 and $3, 179, 184.49) higher profits than the Nigerian feedstock, but the CO, NOX, & SO2 emissions from Nigerian feedstock were lower than that of SA. The findings from this study could be used as a platform for decision making by potential investors and stake-holders, and further research and development in the area.

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OPEN ACCESS 022022

An Overview of Corrosion Inhibition using Green and Drug Inhibitors

O S I Fayomi, I G Akande and U Nsikak

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Corrosion has been a predominate problem for industries ranging from oil and gas to automobile. Various methods have been utilized to combat this phenomenon, some methods have causes great environmental effect that are harmful to humans. This has necessitated the use of green corrosion inhibitors. This review paper delves into the subject matter and reports the inhibition efficiency of green corrosion inhibitors that have been used for combating corrosion, because of their eco-friendly nature.

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OPEN ACCESS 022023

Brief review on cathodoluminescence application in solid-state devices

M.E Emetere, J.T Abodunrin, O.O Fayomi and C.O Iroham

− Hide abstract PDF

In this review, the chronological advances of solid state lighting (SSL) alongside the theoretical predictions was examined. The discussion includes its crystallographic orientations, substrate growth, colour rendering, misfit dislocations, quantum well fabrication, stacking fault and energy efficiency. It has been discovered that the challenges confronting the potential of SSL devices may not just be ambient temperature of the operating environment or the safe limits of the blue/white-light hazard. This paper sheds lighter on the physics responsible for the SSL white lighting, wave function lapping at different crystallographic orientations and stress relaxation limits of quantum well (QW) heterointerfaces.

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OPEN ACCESS 022024

Effects of kenaf core and bast fibers as dispersing phases on low density fiberboards (engineered wood)

B.U. Anyanwu, O. A Adebomi, O.S. Fayomi, S. I Kuye, U.T. Igba and O.O. Oluwole

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Fiberboards are engineered woods made from a composition of wood chippings, wood fibers, sawdust etc., glued together with adhesives. Low density fiberboards (LDF) are part of the classes of fiberboards widely used in Nigeria because they are readily available, relatively cheap and offer good aesthetic values, compared to conventional woods. However, they possess low strength, durability and lifespan, thus making them susceptible to damage during service. The aim of this study was to determine the effect of kenaf core and bast fibers (*Hibiscus cannabinus)* as one of the dispersing phases in low density fiberboard production, also known as particleboards. The materials and methods employed in the study, followed procedures in established standards and literatures. The different composite materials were weighed and mixed properly for about 10 minutes to ensure homogeneity in the mixture. Thereafter, the materials were placed in a mould of uniform thickness and compressed to different fiber board samples using a compression press machine, for about 10mins. A series of physio-mechanical tests such as water absorption, density, tensile strength, modulus of elasticity and modulus of rupture were conducted on the developed fiberboard samples as well as the control samples. The results showed that the average values for water absorption and density of the developed samples enhanced with kenaf core and bast fibers were 5.480% and 0.027 g/cm^3 respectively. These values compare well with that of the control samples. Also, the tensile strength, modulus of elasticity and modulus of rupture of samples enhanced with kenaf gave average values of 31.842 MPa, 2.920 GPa and 16.58 N/mm^2 respectively. These values also compare well with that of the control samples. From the results gotten and all the properties determined, the study showed that kenaf core and bast fibers can be employed appreciably as dispersing phases for low density fiber board (LDF) composite production.

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Studies of the In-Situ Epoxidation of Rubber *(Hevea Brasiliensis)* Seed Oil by Performic Acid

O.R. Obanla, J.D. Udonne, O.O. Ajani, M.E. Ojewumi, O.J. Omodara and B.A. Oni

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Studies on the epoxidation of rubber (Hevea brasiliensis) seed oil, a renewable source with formic acid was performed in the presence of 30% hydrogen peroxide at a of temperature 40, 50, 60, 70 °C. The process is favoured by an increase in temperature forming a product with high oxirane content which is as a result of mole ratios of formic acid and hydrogen peroxide. Products of high oxirane content are commercialy viable in the production of polyvinyl chloride (PVC). Natural rubber and other products can be obtained from this in- situ technique. Studies in this research shows that the rate of epoxidation increases with an increase in temperature.Oxirane values of 2.30, 3.62 and 4.73 for the various temperature. However high oxirane content of 6.22 was obtained at 70 °C which is in line with literature. FTIR analysis was also carried out on the epoxidized rubber seed oil which shows the peaks of oxirane cleavage.

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OPEN ACCESS 022026

Recycled Aggregate in Pavement Construction: Review of Literatures

A. Busari, E. Adeyanju, T. Loto and D. Ademola

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The built environment consumes a lot of energy and material. A huge demand of about 40 billion tonnes of aggregates is demanded for construction purpose. The cost of material accounts for more than 60% of the total project cost. However, 10% of construction material end up as demolition wastes yearly. Aggregate is a beneficial building component in construction. There is much need to develop ways to ensure it is utilized properly as construction and demolition waste contribute a large percent to landfills. This review of literature examined the generation of construction and demolition waste generated in developed countries, waste characterization, and utilization in pavement construction. Additionally, environmental, economic and social benefits of the reuse of this waste was espoused. The result of the review revealed that The initial construction material quality, scale of the project, contract and construction mode used affect the amount and quality of CDW. CDW are bulky and not suitable for composting and incineration. Ultimately, the utilization of this waste would reduce the amount of raw material used in construction leading to conservation. Also, there would be reduction in the energy cost associated with mining (quarrying), extraction and transportation of natural aggregates in track with the conservation of natural resources and the construction of cost-effective pavements.

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OPEN ACCESS 022027

Comprehending the energy consumption pattern of occupancy of an academic structure

S O Oyedepo, J O Dirisu, U K Efemwenkiekie, O S I Fayomi and E E Essien

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The energy consumption in the Covenant University campus community has been investigated. A tour round the structure was undertaken to ascertain the consumption culture and to identify lapses on energy usage. An energy consumption pattern roadmap is necessary in accounting on how energy is used up and decision on utilizing redundant energy. This is the focus of the research work to provide an insight to the rate of energy utility. The electrical energy demands are going to get increased in future. Measures are to be taken to minimize use of electricity everywhere so as to reduce undesirable financial load. It is advisable to carry out energy assessment in the campus from time to time, to achieve more effective and proficient use of energy.

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OPEN ACCESS 022028

Development and Performance Evaluation of Thermostat Controlled Rotary Dryer for Agricultural Produce

A. O. Adeodu, S. O. Akinola, I. A Daniyan, D. O. Akinlosola, O. R Oloyede and O. O Alufa

− Hide abstract PDF

Drying is ubiquitously used operation that improves on storage life of agricultural produce, either solid, liquid or slurry. Most dryers with relatively advanced technologies are expensive while the cheaper ones are manually regulated. This paper aimed at development of a direct and con-current rotary dryer that uses rolling action with hot air to effectively remove moisture from materials. The machine consists of a hopper as passage into dryer, dryer shell, heater housing, product discharge unit, shell flight, air blower for hot air distribution, thermostat for temperature regulation, temperature probe to sense the temperature from the heater as well as variable speed electric motor for power transmission. The novelty of the design is the integration of temperature regulator to the heating unit to make it thermostat-controlled. The materials for the design were selected based on strength, availability and economic value. The design calculations were done using existing machine design theories to obtain relevant design parameters. The performance evaluation showed that the machine is capable of drying various agricultural produce, say rice and yam from their initial moisture content levels of 85 and 75 % to 10 and 7 % final moisture content level respectively, at the rate of 1.2 kg/hr with the inlet air temperatures of 120° C for yam and 135 ° C for rice with humidity of 0.015. The use of machine would help to regulate drying temperature and reduce the need to manually monitor the drying process thus relieving mostly rural uses some effort in labour.

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OPEN ACCESS 022029

Prospects and challenges of cathodoluminescence imaging in solid-state devices: A brief review

M.E Emetere and N Adeyemo

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The prospect of cathodoluminescence (CL) imaging is evident in its multi-versatile application. For almost three decades, the use of CL imaging in solid-state research has evolved into a reliable characterization tool. In this paper, a chronological review on the theoretical dynamics of CL on semiconductor and nanoscale materials was presented. It was concluded that the optimization of the CL imaging process depends on the microstructural abnormally of the sample.

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OPEN ACCESS 022030

Workshop Queue System Modification Through Multi Priority Strategy

U. C. Okonkwo, I. P. Okokpujie, B. N. Odo and O. S. I. Fayomi

− Hide abstract PDF

This research focused on the modification of a queuing system in a workshop practice that repairs crankshafts using multi priority strategy. The random distribution of the inter arrival time of the crankshafts as well as the service time were statistically determined using Chi square goodness of fit test. The results obtained show that all the classes conform to Poisson distribution. For the non-preemptive priority, the mean waiting time in queue results for the first, second and third classes are 0.066, 0.09 and 0.224 day, respectively, while for the preemptive priority the three classes show 0.007, 0.036 and 0.258. Besides, the mean waiting time in queue for no priority system is 0.17 day. Arrivals that are of higher priority classes in preemptive priority systems enjoy huge improvement when compared with non-preemptive system. On the other hand, the improvement gained in higher

priority classes has detrimental effect on the low priority class. Similar scenario plays out when the results of the mean waiting time in the system was analyzed. It is therefore advocated that priority strategy should be adopted for a system that may have urgent or semi-urgent jobs among the pool of jobs that needs repair to avoid possible losses arising from frequent reneging or balking of such jobs.

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OPEN ACCESS 022031

Powering Africa Using An Off-Grid, Stand-Alone, Solar Photovoltaic Model

Kingsley Ukoba, Olugbenga Fadare and Tien-Chien Jen

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Over 90 % of Sub-Saharan Africa is without electricity access. The rural areas of the few African countries with access lack electricity. Studies have suggested that solar energy systems hold the key to powering the continent. Although, a vast population currently operate fossil-fuel powered generators to meet their basic electricity needs. The study is designed for a 2-bedroom flat inhabited by an average Africa family. A residential building in Akure, Ondo State, Southern Nigeria has this model installed in a stable and reliable condition. The proposed solar photovoltaic model is composed of solar panels, Direct Current (D.C) cables, charge controller, solar batteries, solar inverter, solar bulbs and instrumentation gadgets. The model is an optimum size solar Photovoltaic installation with a maximum power input of 1, 800 W. The maximum allowable load is 1, 000 W and a maximum charging D.C voltage of 28.2 V. The solar-powered system is equipped with a set of six (6) 300 Watts monocrystalline solar panels. A commercial maximum power point tracking (MPPT) charge controller was used for this model. Two (2) units of Deep Cycle AGM Solar Batteries connected in series are installed for the solar photovoltaic system. A pure sine wave solar inverter was used in the developed solar PV model to transform D.C electricity available in the batteries to A.C electricity. Themodel is a flexible one which could be scaled up as may be desired or required. The solar photovoltaic model has a very high prospect for powering Africa. The model has ample potentials to fulfil economic, social and environmental objectives which qualifies it as a sustainable energy option to improve the quality of life. The implementation of this form of sustainable energy will open even development of the continent and end the electricity woes of the populace.

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OPEN ACCESS 022032

GIXRD, Raman and Surface analysis of TiC thin film coating produced by RF Magnetron Sputtering

O.O. Abegunde, E.T. Akinlabi and O.P. Oladijo

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In this research, TiC thin films were successfully deposited on Ti6Al4V substrate using RF magnetron sputtering under different RF power, temperature and sputtering time. The resulting properties of TiC thin film were characterized using Grazing incidence X-ray diffractometer (GIXRD), Raman spectroscopy, Field emission scanning electron microscope (FESEM) and optical profilometer for structural and surface morphology of the thin film. The results show that the properties of the TiC thin film were affected by the RF magnetron sputtering parameters. Preferential orientation (200) plane was noticed for all the coating. The Raman analysis revealed the presence of

both D- mode which is as a result of structural disorder and G-mode which indicates presence of surface impurities and defects at RF power of 150 W. The thin films become homogeneous and densely packed at RF power of 200 W. The surface roughness was also investigated. The least surface roughness was found at RF Power of 200 W, time of 2.5 Hrs and temperature of 100 °C.

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OPEN ACCESS 022033

Substrate effect on the morphology, structural and tribology properties of Titanium carbide thin film grown by RF Magnetron Sputtering

O Abegunde, E T Akinlabi and P Oladijo

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Substrate – coating behaviour plays a crucial role in determining the efficacy of the resulting properties of thin film coating. This research work studies the impact of two different substrates (Ti6Al4V and CpTi) on the mechanical properties of Titanium carbide thin film coating deposited using RF Magnetron Sputtering. The tribology properties were characterized using Nanoscratch and Tribo-tester. GIXRD and FESEM were used to study the structural and surface morphology of the coatings. The micrograph images of the FESEM show a similar trend for the film distribution while the GIXRD highest peak intensities vary for the coating. Spallation, bending crack and delamination of the film were noticed under high load condition and the micro-scratch result shows good adhesion between the coating and the substrates.

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OPEN ACCESS 022034

Experimental investigation of flow and heat transfer in a channel with dimpled plate

Josephine Oluwaremilekun Oluyale, Moses Omolayo Petinrin, Adeyinka Ayoade Adegbola and Felix Adedayo Ishola

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This study presents the experimental investigation on the effect of dimpled arrangements on flow and heat transfer characteristics. Three plate surfaces were prepared (smooth, evenly distributed spherical dimples and unevenly distributed spherical dimples) and were placed successively in a channel. The unevenly distributed dimpled plate had the same dimple density with the evenly distributed dimpled plate but had varying transverse pitches to concentrate the dimples at mid-plate in flow direction. Data obtained from the experiment were analysed to determine the performance of each dimpled plate channel. It was observed that the average Nusselt number due to the heat interaction with the air-flow increases with the Reynolds number. The evenly and unevenly dimple plate channels had respectively, 75.7% and 91.8% increase in Nusselt number over the smooth channel. The flow friction factors of the evenly and unevenly dimple plate channels were merely more than that of smooth plate channel by 0.59% and 0.67%, respectively. Thus, the unevenly dimple plate channel had the highest overall thermal-hydraulic performance, followed by the evenly dimple plate channel.

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OPEN ACCESS 022035

Evaluation of Heat Transfer on Bone Cemented Hip Replacement

J. L Chukwuneke, J. U Ikekwem, I. P Okokpujie and S. O Ongbali

− Hide abstract PDF

Evaluation of observable response of heat of bone cement in hip replacement was studied. In an exothermic reaction, bone cementing in a polymerization reaction between the liquid and the powder monomer, provides the bonding mechanism between the prosthesis stem and the femur cavity. This is of concern to biomechanics engineers on the mechanism of heat transfer between the femur bone, the cement and the prosthesis stem. The ANSYS software together with Autodesk software was used to model the scenario, steady state thermal structural analysis was used to simulate it. From the observation, the PMMA polymer (used as bone cement) temperature from the exothermic reaction raised the temperature in the assembly thereby creating a flow of heat amounting to $5.11x10^{-7}W/m^2$ in which only $2.83x10^{-7}$ W/m^2reached to the femur bone as others has been absorbed by the femur bone and prosthesis stem.0.59kJ/kg.K and 1.297kJ/kg. Kare the values of specific heat capacities of femur bone and PMMA respectively while the values of young modulus for femur bone and PMMA are 18.79GPa and 28.78GPa respectively. This result shows how possible it is to determine these properties from the studies of simulation.

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OPEN ACCESS 022036

Modelling and Simulation of Globular Equiaxed Eutectic Solidification in a Direct Chill Casting of Aluminium Binary Alloy Systems

G.C. Nzebuka and M.A. Waheed

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A comprehensive modelling of globular equiaxed eutectic solidification in a direct chill casting of aluminium binary alloy systems has been presented. The modelling applies the finite volume method in a diffusion dominated 2D axisymetric domain. The model couples the macroscopic heat transfer equation with solidification kinetics model to predict total solidification time, actual solidification time, grain size, undercooling, and grain growth rate in the two binary aluminium alloy systems namely; Al-Cu system and Al-Si system. The linearization of the solidification kinetics source term coupled to the heat transfer equation ensures robust and converged computation of the numerical model. The results obtained show that under the same cooling conditions at the billet surface, Al-Cu alloy system solidifies faster than Al-Si alloy system. In addition higher undercooling, grain size and growth rate are evident in the former than the later.

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OPEN ACCESS 022037

Economic Impact of Corrosion in Oil Sectors and Prevention: An Overview

O S I Fayomi, I G Akande and S Odigie

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The oil and gas industry is facing many corrosion problems. They have been faced with contaminants such as H_2S and CO_2 which deteriorate pipe lines and machine components. Over time, corrosion can occur on these machines' inner surfaces. The pipelines must transport large amounts of crude oil which must be able to withstand large amount of pressure. The storage containers for the oil and gas

are made of aluminium and steel which must be protected because of their susceptibility to corrosion which impacts directly or indirectly on the economy. Steel and aluminium are important metals used from manufacture to distribution of final products in almost every part of the oil and gas industry. This paper reviews the effect of corrosion on metal and some of the approaches towards corrosion control in engineering sectors.

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OPEN ACCESS 022038

Brief review on the physics of solid-state lighting device

M.E Emetere, J.T Abodunrin, O.O Fayomi and C.O Iroham

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In this review, the chronological advances of solid state lighting (SSL) alongside the theoretical predictions was examined. The discussion includes its crystallographic orientations, substrate growth, colour rendering, misfit dislocations, quantum well fabrication, stacking fault and energy efficiency. It has been discovered that the challenges confronting the potential of SSL devices may not just be ambient temperature of the operating environment or the safe limits of the blue/white-light hazard. This paper sheds more light on the physics responsible for the SSL white lighting, wave function lapping at different crystallographic orientations and stress relaxation limits of quantum well (QW) heterointerfaces.

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OPEN ACCESS 022039

Computational synthesis of carbon doped $BaAl_4S_{7-x}C_x$ as a unique solid-state device

M.E Emetere, J.T Abodunrin, O.O Fayomi and C.O Iroham

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New solid-state materials are emerging with precise prospect of revolutionizing new electronic device. The $BaAl_4S_7$ is originally a non-linear optical material. However, the unique plane analysis suggests that it could be converted into a white light source solid-state device if doped. In this paper, we present a unique doping technique that converts $BaAl_4S_7$ to a unique solid-state device by doping the sample with carbon at unique positions.

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OPEN ACCESS 022040

Electrochemical And Metallurgical Behaviour Of Ductile Iron In Acidic, Basic And Saline Environments

T. G. Ayelabowo, A. A. Daniyan, J. O. Olawale, D. A. Isadare, F. I. Alo, O. S. I Fayomi and L. E. Umoru

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This research work presents the comparative study of the effect of some selected environments on the corrosion characteristics and accompanying changes in microstructure on ductile iron. In this study, the atmospheric corrosion of ductile cast iron immersed in acidic (2M H_2SO_4), basic (2M NaOH) and saline (3.5% NaCl) environments, which represents the major atmospheric environments in

which metals are mostly subjected to while in service. The corrosion characteristics of ductile iron have been determined by current potential curves. To determine the corrosion rates, the anodic and cathodic Tafel regions extrapolating to corrosion potentials were used. The individual corrosion rates of ductile iron were evaluated for a time period of 600 seconds, 1mv/s scan rate and Tafel plot range of -250mv to 250mv. Each sample were dimensioned, polished, pickled in dilute HCL and rinsed with distill water, degreased with acetone followed by drying and then mounted for the potential dynamic tests. The results obtained reveal that corrosion of DI in 2M H_2SO_4 is (0.25699 mmpy), 2M NaOH is (0.025955 mmpy), 3.5% NaCl is (0.10396 mmpy) and distill water is (2.6447e-05 mmpy). The results obtained showed that corrosion rate in decreasing order is 2M H_2SO_4, 3.5% NaCL, 2M NaOH and lastly as expected distil water. The corrosion product morphologies of the DI showed the nodular matrix was gradually covered up as the corrosion rate increased. This work is important reference point for the corrosion effectiveness of ductile iron in major atmospheric conditions.

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OPEN ACCESS 022041

Atmospheric corrosion from aerosol loading Over Yekepa

M.E Emetere, J.M Emetere, S.E Sanni, E.E Okoro, C.A Onumejor and O.E Omotosho

− Hide abstract PDF

In this research, the impact of aerosol loading on the atmospheric corrosion over Yekepa is presented. Fifteen years primary (aerosol optical depth) dataset was obtained from the Multi-angle Imaging Spectro-Radiometer (MISR). Aerosol loading were generated fom the primary dataset. The univariate statistic over Yekepa shows the mean value of 0.52038392857143 0.44143303571429 0.39041071428571 in X, Y and Z directions prespectively. It was confirmed that the current trends of environmental events over Yekepa-Liberia could increase atmospheric corrosion.

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OPEN ACCESS 022042

Effect of Stratigraphic features on Deep-Water Cementing Operation – A Review

E.E. Okoro, S.E. Sanni, M.E. Emetere, M. Omeje and K.B. Orodu

− Hide abstract PDF

Drilling operations in deep-water environment is faced with technical challenges despite its massive record of huge hydrocarbon reserves when compared with onshore oil and gas fields. The weak, unstable formations coupled with adverse deep-water conditions poses as a challenge to cementing operations. Narrow pressure window conditions are encountered when the wellbore pressure required to contain subsurface pressures lies close to the pressure at which losses may be sustained. This is evidence in the ratio of pore pressure to vertical stress moving close to lithostatic condition. This can either be caused by porous formation or by the way of inducted fractures in weak or sheared or unconsolidated zones in the subsurface. This study showed an overview of some possible challenges faced in deep-water cementing operations in relation with stratigraphic features of the deep-water environment. From the review it was gathered that the stratigraphic nature of deep-water environment has a huge effect on cementing operations for oil and gas wells. The study also highlighted some gaps in the literature which require urgent attention to reduce loss circulation.

These gaps include but not limited to: spacers generating sufficient downhole force to overcome the yield stress of the mud and the need for a new type of treatment for lost returns. Managed pressure cementing operations may control wellbore pressures.

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OPEN ACCESS 022043

Effect of Aluminium Addition and Grain Refinement on the Microstructure, Mechanical and Physical Properties of Leaded Brass Alloys

C.P. Egole and G.C. Nzebuka

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Because Cu-Zn alloys have excellent combination of both physical and mechanical properties such as high thermal and electrical conductivities, good tribological behaviour, relative stability in corrosive environments and high mechanical strength, their study is very important for industrial and academic purposes. Review of previous experiments of leaded brasses focused on the effect of small addition of Al on microstructure and mechanical properties and did not evaluate physical behaviour of the alloy. In the current work, the influence of heavy aluminium addition and grain refinement for leaded brasses was investigated and the analysis is extended to physical properties evaluation. The results obtained show that mechanical properties are directly dependent on the microstructure which is in agreement with previous experiments. Initial addition of Al to the alloys does not result to heavy increase in hardness, but further increase in Al and addition of inoculants lead to significant change in hardness. The same pattern of modification was observed in both compressive strength and ultimate tensile strength. For the physical properties, there is little discrepancy to the sequence of their modification, most especially after grain refinement. There is a steady decrease in electrical conductivity even after grain refinement. This is not the case for thermal properties. The thermal conductivity reduced and then increased tremendously after Ti addition. The microstructure was modified with the addition of Al and Ti grain refiners. The presence of Al promoted formation of β-phase seen in the dark regions of the microstructure while Ti aided equiaxed grain formation.

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OPEN ACCESS 022044

Utilization of Palm Fruit Fibers as Constituent Materials for Hand Mould Clay Bricks

D.D. Adegoke, R. Afuwape, D.O. Olukanni and G. Bamigboye

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The production process of palm oil generates a huge amount of waste. As Nigeria is one of the largest producing countries, the fruit fiber wastes from palm oil processing have received a low level of waste management and have been a long-term environmental concern. This study is focused on recovery of the palm fruit fibers and its utilization as a constituent material for locally hand mold clay bricks. Varying percentages (1% to 3%) of palm fruit fiber was introduced into local hand mold clay. The bricks produced were tested for optimum moisture content and dry density. Some preliminary tests such as natural moisture content determination (wet and dry), Specific gravity test, Particle size distribution test (Sieve analysis), Atterberg limit test, Compaction test (Standard Proctor), Water absorption test, and Compressive strength test was carried out. The results show a decrease in optimum moisture content as the percentage of the palm fruit fibers increased from 1% to 3% in the

soil sample while the maximum dry density increased. With the addition of 1% to 3% of the palm fruit fibers and the mix sun-dried, noticeable improvement in the compaction characteristics of the soil sample was observed. It can be deduced from the results that for a good construction clay soil, the lower the moisture content, the higher the dry density and the better the quality of bricks. Production of clay bricks with palm fruit fibers could serve as an economic substitute for the growing cost of sandcrete blocks.

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OPEN ACCESS 022045

Descriptive perspective on factors affecting the complete adoption of information technology systems in the construction firms

K. Dithebe, C.O. Aigbavboa, W.D. Thwala and A.T. Malabela

− Hide abstract PDF

Information technology as a strategy to process, store and transfer information is pivotal for the success delivery of information within different industries, construction in particular. Given the benefits associated with the use information technology this study focuses on the factors that may affect construction firms from being recipients of the benefits of completely adopting information technology systems in South Africa. A quantitative approach was employed to determine factors that require urgent eradication, construction professionals responded to the questionnaire survey that was undertaken. Prior to the survey, data was descriptively analysed using frequencies, percentages, mean item scores and standard deviations. Findings from the study clearly reveal that for construction firms in South Africa to entirely realise the benefits of completely adopting IT systems focus must be shifted away from resisting change, providing inadequate training and employing personnel with no management skills. More so, results show that certainty is required regarding lack of integrity, durability and reliability of the systems, on-going maintenance costs as well as the importance and introduction of client leadership. Above any other barrier, the aspect of costs associated with the complete adoption of IT systems is crucial, while the extent of involvement of key role players needs to be further determined.

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OPEN ACCESS 022046

Investigation on Effect of Material Compositions on Machinability of Carbon Steels

S. Abdulkareem, T. S. Ogedengbe, J. O. Aweda, T. K. Ajiboye, A. A. Khan and M. A. Babatunde

− Hide abstract PDF

Steels are basically classified based on their carbon contents. In view of this, the processing of steels is greatly affected by their composition, particularly their carbon content. This paper reports on the machinability of three different steels with varying carbon contents. The steel samples were sourced from Owode metal market in Ilorin, Kwara State and their percentage compositional analysis was carried out at Universal Steels Limited, Lagos. The steel samples were classified into high, medium and low carbon steels based on their percentage carbon content. The machining condition was wet and the machining parameters used were depth of cut (0.2 – 0.6 mm), feed rate (0.05 – 0.15 mm/rev), and cutting speed (100 - 150 rpm). The experimental runs were designed using Taguchi orthogonal array of Minitab version 16 and the cutting temperature was monitored with a digital thermometer

and k-type thermocouple wires. The experimental results were analysed using Minitab 18 with a focus on percentage contribution of various factors affecting surface roughness, chip morphology, cutting temperature and material removal rate. Results show that surface finish is highest in low carbon steel and lowest in high carbon steel. The responses show that machinability of the steel improved with a reduction in carbon content.

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OPEN ACCESS 022047

Decontamination of Wastewater Effluent using Sugar Cane Bagasse and Soybean Hulls

S. E. Sanni, J. O. Odigure, M. E. Emetere, E. E. Okoro, O. Agboola and Y. O. Sherif

− Hide abstract PDF

Wastewater effluents from industrial processes often pose environmental as well as health risks to humans when these waters are consumed without proper trexatment. In this study, distilled water and citric acid were used as modifiers in order to establish the comparative abilities of modified soybean hull and sugarcane bagasse as means of reducing copper and zinc chlorides to their metals and subsequently adsorbing the metals in order to propose both materials as low cost adsorbents for heavy metals. Based on the results, the modified soybeans have good potential for adsorbing Cu metal while sugarcane bagasse showed preferential adsorption of Zn from waste water. Also, results from optimization gave a pH of 4 and 5 for the modified forms of the bagasse and soybean respectively. While a mass of 1g of each adsorbent gave the best removal rate for their preferred metals, the optimum volume for the highest metal adsorption was found to be for solvent of 35 ml/g adsorbent. Adsorption rate was found to increase with temperature and time for both adsorbents.

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OPEN ACCESS 022048

Effects of Waste Management in Beverage Industries: A Perspective

A.U. Samuel, F. Oyawale and O.S.I Fayomi

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In attempt to eliminate wastage in the beverage industries a lot of reformations have been carried out in the past. Some of these reformations involve redesigning of operation process and repackaging of the content using scientifically improved materials. Packaging of beverages has been done using glass bottles, plastic, nylon and metal can. Although each of these packaging materials has one short coming or the other but not without few advantages. The beverage industry exhibits gigantic potential to minimise waste and shot the loops of recycling. Great commitment to waste reduction and recycling will provide extensive financial and countless environmental benefits. Concentrating on waste management can help to address raw material cost increment and sustainability of production. This paper seeks to investigate the sources of waste in beverage industries and several techniques that have been used to minimise them.

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OPEN ACCESS 022049

DNA from Plant leaf Extracts: A Review for Emerging and Promising Novel Green Corrosion Inhibitors

Isaac Ekere, Oluranti Agboola and Samuel Eshorane Sanni

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With growing global awareness and concern for environmental protection through the use of less hazardous and environmentally-friendly extracts of plant origin, there has been a plethora of green corrosion inhibitors research with far reaching contributions to the science of corrosion prevention and control. Attention has increasingly turned towards green corrosion inhibitors, compounds of natural origin with anti-oxidant activity towards metals and their alloys. Green inhibitors have been investigated for their corrosion and adsorption properties with good results. The findings from these research works provide evidence of the adsorption behavior of green inhibitors which was confirmed by the adsorption isotherms that were proposed. Adsorption is the first step of any surface reaction and since corrosion is a surface phenomenon the effectiveness of green corrosion inhibitors is related to their ability to adsorb on metal surfaces. This review proposes the potential of plant dna as an emerging and promising novel inhibitor for mild steel. It begins with a list of plants that have been used in studies to determine corrosion inhibition properties and moves on to establish the adsorption behavior of bio macromolecules; protein, polysaccharides (chitosan) and dna. It reviews studies and investigation of dna interaction and adsorption on inorganic surfaces before focusing on the use of salmon (fish) sperm dna and calf thymus gland dna as green corrosion inhibitors for mild steel. It concludes that plant dna is a promising candidate for green corrosion inhibitor given the similarity between the plant and animal dna structure and function, and the fact that the use of plant is more environmentally sustainable than animal-based product.

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OPEN ACCESS 022050

Use of some agricultural wastes to modify the engineering properties of subgrade soils: A review

O. D. Afolayan, O. M. Olofinade and I. I. Akinwumi

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The drive to diversify the economy in some developing countries have resulted in increased agricultural production and consequently increased agricultural waste. This study reviews some published research works on the reuse of some agricultural wastes for modifying soils with poor engineering properties. The review shows that some agricultural wastes, such as palm oil fuel ash, palm kernel shell ash, rice husk ash, sea-shell powder and sawdust ash, are effective modifiers of subgrade soil and become more effective when combined with traditional stabilizers. The use of stabilizers from agricultural wastes has the potential of reducing the amount of waste disposed of in landfills/dump sites, and at the same time reduce the carbon footprints caused by the use of traditional stabilizers like cement, and the cost of highway construction.

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Corrosion Inhibition Efficiency of *Tamarindus Indica* Leaves Extracts on Mild Steel in Hydrochloric Acid

G.A. Nchewi, L.N. Okoro, F.V. Adams and B.O. Agboola

Tamarindus indica leaves extract was used as a green corrosion inhibitor for mild steel in 1 M hydrochloric acid (HCl) under varied conditions using weight loss technique. The inhibition efficiency, thermodynamics, kinetics and mechanism of inhibition by *Tamarindus indica* leaves extract on the mild steel were determined. The inhibitor's concentrations used for the study were 0.0g/15ml (blank), 0.2g/15ml, 0.4g/15ml, and 0.6g/15ml, at the temperatures of 28°C (301K), 40°C (313K), 50°C (323K), and 60°C (333K). The results obtained showed that the inhibition efficiency of the inhibitor was inversely proportional to the temperature, but directly proportional to the concentration of inhibitor in the acid. The maximum efficiency of 79.68%, was observed at 28°C (301K) and at a concentration of 0.6g/15ml. The heat of adsorption and free energy (ΔGads) calculations yielded negative values. This indicates that the reaction between the inhibitor molecules and the metal surface was favorable since all the calculated values were negative. As the concentration of the inhibitor increased, the negativity of the ΔG_{ads} increased; suggesting physical adsorption. The data obtained fitted in the Langmuir and Temkin adsorption isotherms at lower temperatures. The results from the phytochemical analysis showed that saponins, were absent, but the extract has tannins, phenolic compounds, alkaloids, cardiac glycosides and flavonoids.

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OPEN ACCESS 022052

Analysis of Recycled Water for Reuse

Fatima Aliyu, Madu Joshua, Muhammad F. Yahaya, Feyisayo Victoria Adams, Linus N. Okoro and Jimoh Luqman

Recycled water at a facility in Yola, Nigeria was studied for its suitability for irrigation. Biological and physicochemical analyses of the recycled water samples from four different points namely; A (inside pool; chlorinated), B (outlet 1; after chlorination), C (outlet 2; before receiving tank) and D (outlet 3; for irrigation) were carried out for four weeks. The physicochemical analysis include temperature, pH, turbidity, NO3-, total dissolved solids (TDS), Cl^-, heavy metals and alkalinity were studied. The pH values obtained varied between 6.9 and 8.1 and were within the acceptable values for irrigation water. The water samples obtained in week 4 had higher turbidity and TDS values as against samples obtained in weeks 1, 2, and 3. High NO3- concentration was found in the water sample taken in weeks 1 and 2 compared to weeks 3 and 4 water samples. Meanwhile, Cl- concentrations were low in the water samples obtained in weeks 1 and 2 relative to concentrations in weeks 3 and 4 water samples. Metals detected from AAS were copper with 4×10^{-5} ppm in all the points (A, B, C and D). The concentrations of iron were 2.72×10^{-3}, 5.54×10^{-3}, 3.62×10^{-3} and 2.98×10^{-3} ppm in samples A, B, C and D, respectively. Fecal coliforms present were pathogenic coliforms and the Biochemical Oxygen Demand (BOD) analysis showed negative values due to presence of chlorine in the water samples. There are benefits of availability of recycled water for irrigation but care must be taken not to infect users with pathogenic coliforms which are hazardous to health.

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The Contribution of Bioenergy in the Renewable Energy Technology Mix: Research Perspective

A.C Eloka-Eboka and R Chetty

Renewable energy from biomass, biofuels and biodiesel encapsulated as bioenergy has become an interested aspect of clean energy technology and is currently receiving global attention. Bioenergy produced from renewable feedstocks and sustainable wastes using several technologies is the focus of this research and development presentation. In South Africa, bioenergy in the forms of solids, liquids and gaseous fuels have been characterised as first, second and third generations (1D, 2D and 3D) systems in order to solve myriads and most critical energy aspects of the sustainable development goals of Africa. The technologies evolved have been directed to specific bioenergy feedstocks and needs for optimal utilisation and application and they include: direct combustion (for power generation), anaerobic digestion (for methane-rich gas production), fermentation (of sugars for alcohols as fuels), oil extraction and transesterification (for biodiesel as fuels), pyrolysis (for biochar, gas and oils for fuel and chemicals), gasification (for carbon monoxide and hydrogen-rich syngas as fuels and value added products) and generalised thermo-chemical conversion. The technologies are further driven by arrays of secondary treatments (stabilization, dewatering, upgrading, refining) depending on specific final products. This presentation explored these and all such research and development (R and D) strategies and technological packages of bioenergy in South Africa. These have implications in the commercialisation, entrepreneurship, informing policy and direct impact in Africa's energy sustainability. The exploration of sugar-cane bagasse biomass for use as briquette/pellet fuels are also presented.

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OPEN ACCESS 022054

Comparative Study of Multi-walled Carbon Nanotube Reinforced Natural Rubber Nanocomposite and Multiflex Dynamic Response – 2 Artificial Foot

R. O. Medupin, O. K. Abubakre, A. S. Abdulkareem, R. A. Muriana, A. S. Abdulrahman and J. A. James

The desire to restore the quality of life to amputees has been on the front burner in recent years. This study compares the functional properties of a home-grown nanocomposite (NC) and multiflex dynamic response-2 artificial foot (M.DR2). The inherent challenge of ensuring uniform distribution of multi-walled carbon nanotube (MWCNT) in host matrices was addressed by the use of sodium dodecylbenzene sulfonate ($C_{18}H_{29}NaO_3S$). Carbon nanotubes (CNTs) were synthesised via catalytic chemical vapour deposition (CCVD) technique and the NC was produced using an electrically heated hydraulic press. While the initial decomposition temperature (Tonset) showed that the newly developed material with 260.01 °C is more thermally stable than M.DR2 artificial foot with the temperature of 238.17 °C, incorporation of MWCNTs into the unfilled NR matrix proved a significant change in Tonset. MWCNT loading was found to influence the moisture content of the reinforced matrix by about 7% with the NC being 35% more thermally stable than M. DR2 artificial foot. SEM/EDS micrographs indicated complete embedment of MWCNTs in NR matrix, thereby making it more suitable than M. DR2 foot which was inundated with cavities, thereby making it susceptible to early failure. While it took both materials 120 days to attain saturation point NR/MWCNT-3 is 93% more dimensionally stable that M. DR2 and also demonstrated better resistance to wear. The wear rate results revealed that M. DR2 wears faster than NR/MWCNT-3 by approximately 32%. It can, therefore, be concluded from the foregoing that the home-grown material is to be preferred to its foreign counterpart for anthropomorphic prosthetic foot application.

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OPEN ACCESS 022055

Production and Operational Study of a Local Product in Nigeria. Case Study; Xx Yogurt Company in Ota

E.T. Akinlabi, K. O. Babaremu, I. P. Okokpujie and S. A. Akinlabi

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The Nutritional value of yogurt cannot be overemphasized owing to its general acceptance in the world at large. The product focus for this study is yogurt. It is a local product that is produced by a medium scale company in Ota, Ado-Odo local government area, Ogun State, Nigeria. Their production procedure conforms to the set standards for yogurt production as approved by Standard Organization of Nigeria (SON) and the National Agency for Food and Drug Administration and Control (NAFDAC) in the country such as milk standardization, homogenization, pasteurization, fermentation, cooling, homogenization or smoothing, filling and storage. This research work was carried out for 90 days to study the production process of the xx yogurt, marketing strategy and the likely challenging face by the company. The system runs a very lager line plant layout, and carried out regular preventive maintenance to keep the plant running year-round in a bid to avoid unnecessary additional cost of operation owing to system breakdown as an inevitable eventuality that results from ill-maintenance practices. Their major market is within the Ota metropolis which is actually a great limitation on product visibility and patronage by more end-users. This evaluation study shows that yogurt production process can be stable and more profitable if better marketing strategy and good infrastructures facility can be employed for the production process.

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OPEN ACCESS 022056

Processing and Marketing Risk Factor of Cocoa Industry in Nigeria

E.T. Akinlabi, O. J. Adelakun, I. P. Okokpujie and S. A. Akinlabi

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Cocoa (theobroma cacao) is cultivated mainly for the cocoa beans which can undergo further treatment into various products which includes cocoa powder, liquor, butter and cake. The major challenges experienced by cocoa industries are inconsistency in production, low yield, pest and disease infestation, high cost of acquiring equipment, increase in production sustainability when considering modified varieties, cost of managing crop, organizing chain and cost of quality. This research aim at studying the process of cocoa beans production in other to provide suitable solution for sustainability of the production process. An evaluation method was applied to the analyzed the various processing steps involved in production stage and the plant layout before assessing the marketing risk factors. The result from the evaluation shows that price fluctuation has the highest ranked followed by processing risk factors, due to negligence of majority of cocoa farmers in maintenance and scheduling operation on their machines using kruskal-wallis test. This study identified risk factors, made comparison and proffer solutions to majority of uncertainties common with processing and marketing of cocoa in Nigeria, as well as the detailed steps and the plant layout in other to boost the standard and morale of every individuals considering cocoa processing across any part of the country. Structuring and developing cocoa beans market will help to reduce global prices fluctuation on the international markets and which will enhance the marketing framework.

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OPEN ACCESS 022057

Examining the Roles of Human Capital Theory. What next for Construction Industry?

John Aliu and Clinton Aigbavboa

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The concept of human capital is very common in present-day construction industry with reference to its philosophy and techniques. Human capital (HC) is widely discussed in different fields; hence, its meanings differ from one field to another. This study provides a detailed discussion on the development of the human capital theory under various themes and sub-themes. The study further seeks to discuss the several effects of human capital development on industry success and competitiveness and how this contributes to economic growth in developing countries. Relevant literatures on HC theory and development were extracted from Scopus. Scopus is widely acknowledged as one of the widest interdisciplinary databases for engineering, technology, science and medicine. The Scopus database features over 20, 000+ peer-reviewed journals from over 5000 publishers. The Scopus database allows its users to perform more detailed searching opportunities compared to other databases such as Academic Search Complete, Art and Architecture Complete, Ebsco Host, SpringerLink and Web of science. The distillation of literature through thematic analysis revealed the various roles of human capital and its correlation with construction industry success and growth. Findings from this study revealed that the success of the construction industry is firmly related to the effectiveness of its human capital. The study revealed that the human capital theory is not without its criticisms and barriers. Practically, this study explores the various benefits of human capital to employers of the construction industry. The study suggests that human capital development plays a key part in retaining quality employees and recruiting prospects. Furthermore, investment in human capital goes a long way in improving employee satisfaction, organisational culture and increased productivity. This study contributes to the human capital discourse, which is the measure of economic value provided by employees with reference to their abilities, skills, values and knowledge.

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OPEN ACCESS 022058

Application of Recycled Waste Materials for Highway Construction: Prospect and Challenges

D.D. Adegoke, T. O. Ogundairo, D.O Olukanni and O.M. Olofinnade

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Industrialization and continuous increase in population growth have contributed immensely to various kinds of solid waste generation which most times are indiscriminately dumped. These activities have negative effects resulting in environmental pollution which could be a menace to the environment. Moreover, to preserve the environment, many researchers have made efforts to ensure that some of these wastes are recycled and utilized in the production of various alternative materials as a means of sustainable technology. Among several alternative materials for construction, some of these wastes are considered to be very useful.

This study examines the various recycled waste materials that can be adopted for construction, including their prospects and challenges. Some of the recycled waste materials examined are plastic waste, mill tailings, geopolymers, waste glass, rubber tyre waste, shingles, construction and demolition wastes (C&D) and slag. These recycled materials have been accepted globally due to their characteristic properties which made the materials suitable in the construction industry. This review also examines some limitations relating to the adoption of these materials as alternative construction materials for highway/pavement construction. However, it is generally accepted that reuse of waste materials in construction industry has minimal environmental impact and their exploration would have huge economic impact.

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OPEN ACCESS 022059

Simplified approach to performance evaluation of selected organic compounds for corrosion inhibitor application in petrochemical plants

Roland T. Loto, Muyiwa Fajobi, Ayobami Busari and Aluya Ruth Oghenetejiri

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Corrosion inhibitors have been researched into, studied and applied in numerous industries worldwide to mitigate the electrochemical deterioration of carbon steels in contact with aggressive medium. Effective and sustainable application of corrosion inhibitors in the oil and gas industry necessitates compatibility with the corrosive environment, non-toxicity and must be economical. Corrosion coupon measurement is the oldest and most widely used corrosion monitoring technique. The traditional approach to evaluate the viability of corrosion inhibitor focuses on inhibitor efficiency. Prevailing industry conditions shows this factor alone is insufficient for evaluation of organic chemical inhibitor compounds. This manuscript focuses on the importance and effect of inhibitor concentration, exposure time and Gibbs free energy in evaluating inhibitor performance and on the selection and suitability of organic chemical compounds for corrosion inhibitors.

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OPEN ACCESS 022060

Parametric Effects of Fused Deposition Modelling on the Mechanical Properties of Polylactide Composites: A Review

Abraham Kehinde Aworinde, Samson Oluropo Adeosun, Festus Adekunle Oyawale, Esther Titilayo Akinlabi and Stephen A. Akinlabi

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Polymers are generally inferior in mechanical properties to metals which are the current orthopaedic material for osseointegration in many parts of the world today. This assertion also applies to poly(lactic acid) (PLA), a polyester that has been recently found applicable in tissue remodelling. To improve on its mechanical properties, several processing techniques, inclusive of fused deposition modelling (FDM) also branded as fused filament fabrication (FFF), have been used. FDM has been endeared to many researchers because a range of parameters can be combined to bring about widely different mechanical properties. Although the influence of FDM parameters on the mechanical

properties of PLA is clear, the tensile, compressive and flexural strengths obtained so far are inferior to human cortical bone. The need to improve on this production technique for improved mechanical properties is apparent in all the works examined in this review.

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OPEN ACCESS 022061

The Strength characteristics of Chitosan- and Titanium- Poly (L-lactic) Acid Based Composites

Abraham Kehinde Aworinde, Samson Oluropo Adeosun, Festus Adekunle Oyawale, Esther Titilayo Akinlabi and Stephen A. Akinlabi

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The problem of bone fracture and the need to avoid revision surgery in osteosynthesis are the critical reasons for the gradual shift from the use of metallic fixations to the polymeric scaffold in the orthopaedic applications. However, the mechanical properties of polymers that have become a substitute for metals need to be improved upon. An attempt was made to improve the mechanical properties of poly(L-lactic) acid (PLLA), a biopolymer, by loading it with 1.04, 2.08, 4.17, 8.33 and 16.67 wt.% of chitosan (an organic filler) and Ti-6Al-2Sn-2Mo-2Cr-0.25Si (an inorganic particle). Melt blend technique was the processing technique. Hardness, compressive modulus and fracture toughness of virgin PLLA improved significantly while the resulting composites were found to be less ductile than unreinforced PLLA. Titanium reinforced PLLA displayed superior mechanical properties over the neat and chitin reinforced PLLA. Compressive modulus values of the developed composites were much lower than the modulus of cortical bone, they were, however, mechanically compatible with the properties of cancellous bone. Optical microscopy images also show the formation of pores which are a catalyst for cell proliferation and cell differentiation.

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OPEN ACCESS 022062

Comparative Analysis of Manual Strapping Method (MSM) and Electro-Optical Distance Ranging (EODR) Method of Tank Calibration

O. O. Agboola, B. O. Akinnuli, M. A. Akintunde, P.P. Ikubanni and A. A. Adeleke

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Oil storage tanks are mandated for calibration before putting to use and to be recalibrated as a statutory requirement at every five year interval. Oil tanks could be calibrated by geometrical methods such as Manual Strapping Method (MSM) and Electro-Optical Distance Ranging (EODR) method. This study compares both MSM and EODR in terms of cost incurred, duration of calibration and efficiency. Both methods were found to be efficient as they satisfied 95% minimum efficiency as stated by API MPMS 2.2 standard when compared with the wet method of tank calibration; though the cost of EODR was slightly higher than MSM but this was compensated with higher efficiency and reduced duration/time of calibration.

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OPEN ACCESS 022063

Corrosion Prevention of Metals via Electroless Nickel Coating: A review

O S I Fayomi, I G Akande and A A Sode

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Electroless coating is a chemical process that involves an autocatalytic response of the constituents in an aqueous mixture. It also involves multiple simultaneous reactions, with nongalvanic excitation, that causes the formation of thin film layers i.e. the coating, on the substrate of the material. The reduction of metallic ions required to coat the surface of the metal occurs dues to the reducing agent in that same compound, which supplies an intrinsic potential difference to allow current flow. This follows by the need for the cations of the deposition metal to be reduced by electrons receiving them at the substrate, electrons which the reductant also donates to this surface thereby undergoing oxidation. The most generally used electroless plating technique is the electroless nickel plating method, which involves the deposition of un-crystallized nickel alloy on the substrate, with even thickness regardless of the shape and form of the material due to its independence on current. The paper reviews the tribo-corrosion resistances, mechanical properties and conductivity of electroless nickel coatings.

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OPEN ACCESS 022064

Advances in the development of a tomato postharvest storage system: towards eradicating postharvest losses

O.B. Ayomide, O.O. Ajayi and A.A. Ajayi

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The production of tomatoes has experienced a huge rise over the years as a result of its economic, nutritional and cancer reduction importance. Despite the rapid advancement of technology in the past century, storage of tomato fruits remains a major problem experienced in the postharvest chain in most developing countries. This study gives a survey of the various causes of tomatoes postharvest losses, the different methods used in storage of the fruit over time and their limitations. It was found that the conventional methods used in tomatoes storage, improved its shelf life but was accompanied by some significant losses in quantity and quality. Hence, generating a need for a postharvest storage system taking into cognizance the optimum conditions required for the fruit storage. The development of a thermally controlled postharvest storage system with the sole purpose of increasing shelf life and minimize the rate of deterioration becomes inevitable.

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Studies on FT-IR Spectroscopy of modified Montmorillonite clays applied for the removal of T-2 toxin in maize

B.K. Olopade, S.U. Oranusi, O.C. Nwinyi, P.B. Njobeh and I.A. Lawal

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Montmorillonite clay has a wide range of industrial applications which include the removal of mycotoxins in foods and feed because of its low toxicity both *in vitro* and *in vivo*. T-2 toxin is produced mostly by fungal species of *Fusarium*. Other T-2 producing fungal species are *Myrothecium* and *Stachybotrys*. T-2 toxin poses several health hazards such as dystrophy in the brain, heart, kidney

and liver as well as ulceration and necrosis of the digestive tract in man and animals. To reduce T-2 toxin in maize, montmorillonite clay modified with lemongrass essential oil (MMT-LGEO) and montmorillonite clay washed with NaCl (Na-MMT) were applied to maize at a concentration of 8% and 12% and kept under storage for one month at 30°C. Untreated maize samples and unmodified montmorillonite clay (MMT) served as controls. The FTIR spectra were recorded for the two treatments and unmodified montmorillonite clay (MMT) used for the removal of T-2 toxin in maize. The FTIR spectra of the two treatments and unmodified clay (MMT) showed the major functional groups as Si-O and -OH. All the treatments reduced the level of T-2 toxin in maize. However, sodium montmorillonite (Na-MMT) and montmorillonite clay modified with lemongrass essential oil (MMT-LGEO) were more efficient than unmodified montmorillonite clay (MMT) in the removal of T-2 toxin in maize.

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OPEN ACCESS 022066

Investigation into Alternative Energy Sources from Waste Citrus Peel (Orange): Approach to Environmental Protection

M. E. Ojewumi, D.T. Oyekunle, C.V. Amaefule, J.A. Omoleye and A.T. Ogunbiyi

An experimental study has been carried out on an alternative source of energy from citrus peel waste. A widely used material, pectin, has been extracted from orange peel (OP) and subsequently converted into ethanol with the use of a bacteria and fungi. Dried peels were split into several particle sizes of 0.075, 0.5, 1.0 and 5 mm. It was noted that OP with 0.75 mm particle size produced pectin of low volume while larger 1.0 mm OP particle size produced a high pectin volume. OP of 802 g was used to produce 1, 770 ml of pectin, this illustrate that citrus fruit (specifically orange) contains pectin in a large quantity. A mixture of *E.coli* (bacteria) with yeast (fungus), and their individual components were used on pectin obtained. However, it was observed that a mixture of pectin, *E.coli* & *S. cerevisiae*, and a combination of sample pectin with *E.coli* produced an encouraging volume of ethanol as against no ethanol produced when a mixture of sample pectin, yeast and pectin sample only. The amount of energy contained in the gross ethanol produced was 1526.6 btu, this can be combined with purified gasoline so as to attain the optimum energy content that can be used to run an indigenous processing plant for citrus fruit in Nigeria.

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OPEN ACCESS 022067

Review of Water Distribution Systems Modelling and Performance Analysis Softwares

O.M. Awe, S.T.A. Okolie and O.S.I. Fayomi

Water is a critical and crucial substance for sustenance all over the world. The need for water distribution systems to satisfy increasing demand and also to satisfy quality requirements has birthed a surging need to model real-life situations in order to access the workability of Water distribution system (WDSs) and their ability to operate efficiently. Through the review of the analysis of modelling software and performance analysis, it was deduced that different licensed software and freeware products are available for design and model of various categories of WDSs, ranging from

simple to complex, realistic and even hypothetical. It was discovered that software with licenses offers versatility, flexibility and precision in modeling various categories of hydraulic models with various features over software that are open for all. Therefore, the decision on which software to use for the design of water distribution systems is predicated on software precision, the overall project cost, software - required data, complexity of system, aspect of system to be modelled (quality, demand, valve operation and location etc.) software specificity related to the types of distribution systems that it can manage and computational and hydraulic criterion.

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OPEN ACCESS 022068

Optimization of Water Distribution Systems: A Review

O.M. Awe, S.T.A. Okolie and O.S.I. Fayomi

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A water distribution system (WDS), being a system of interconnected hydraulic elements ensures water distribution and supply to satisfy demands while optimization is applied in many systems and situations, thus making it an important paradigm in technology. When we try to optimize, we either minimize (resource consumption, cost) or maximize (profit, system performance). This paper reviews optimization of water distribution systems and presents different aspects of WDSs. It also presents the different optimization methods in a detailed manner. Finally, modern sophisticated optimization methods are refined enough to solve complex real-world problems such as WDS design and operations. The categories of challenges being solved include: new WDSs design; expansion and revamping of existing WDSs; pump operation; water quality management; calibration and system partitioning. Reliability, robustness and resilience considerations are often encountered in WDS literature and are still open to analysis because there is no generally acceptable model for permanent inclusion in WDSs optimization.

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OPEN ACCESS 022069

Overview Production Process And Properties Of Galvanized Roofing Sheets

R. E. Elewa, S.A. Afolalu and O.S.I Fayomi

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In search for solution to the challenges posed by the degradation of roofing steel sheet in an aggressive environment, galvanization of steel sheet for roofing of buildings and manufacture of other Engineering structures has been a valuable remedy. Galvanization of steel in recent years has emerged as a physical barrier which minimizes the penetration of contamination of sulphide and chloride ion. Zinc coating of steel top surface is a strategy that has been found to be effective for wide range applications. Galvanized steel sheets have been widely used by various manufacturing company. Occasional switching from steel to other metal like aluminum have not been cost effective because of the present economically situation. This makes substituting galvanized steel difficult. This mini review provides insight to the production process, stages and properties of galvanized roofing steel sheet use in Nigeria and most part of Africa.

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OPEN ACCESS 022070

A review on why women-owned construction firms fail in KwaZulu-Natal?

Theo C. Haupt and Jabulile Ndimande

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The South African government has instituted numerous programs to advance the role of women in the construction sector. While there has been an increase in the overall number of women-owned contractors suggesting a gender-positive environment in post-apartheid, there is a high failure rate of women-owned contractors. This study seeks to explore the primary contributory factors that lead to business failure. A sample of women-owned contractors in Durban was surveyed using an instrument developed from published literature on women in construction in South Africa.

The sample of women-owned contractors was drawn from the Durban area from the Construction Industry Development Board (CIDB) Contractors Register database. Findings suggest that lack of training provided by the industry, dominantly male networks, prejudice and stereotyping, and lack of opportunity were the primary reasons given for failure. This study identifies the failure factors that need to be addressed to increase the participation of women-owned contractors in the construction sector.

The findings provide a review on guidance for remedial interventions that will positively impact the number of women-owned contractors that will survive in the construction sector.

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OPEN ACCESS 022071

Protective Impact Of Molten Zinc Coating Sheets In Contaminated Environment-Review

R. E. Elewa, S.A. Afolalu and O.S.I Fayomi

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Steels are susceptible to degradation orchestrated by the immediate environment which alters their physical, mechanical and electrochemical properties. These challenges have necessitated their protection with molten zinc which solidifies to form protective barrier against external contaminants. Protection of mild steel is a necessity because of its availability and cost effectiveness which has made it the most used metal for structural application in many part of the world. Surface protections of steel incorporate specific properties that enable it to stand a test of time due to the alteration of the surface characteristics. This mini review outlines the impact of molten zinc coating on mild steel and several coating application techniques

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OPEN ACCESS 022072

Sustainable Production: New Thinking for SMEs

P. Onu and C. Mbohwa

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The future of small and medium-sized enterprises (SMEs) depends greatly, not only on operational excellence and performance to execute successful business ideas but also on sustainable production practices that combine both environmental and socioeconomic considerations to meet optimal

product, process and productivity expectation. In an advanced lean operation scenario, such as the Production Preparation Process (3P) or Total Productive Maintenance (TPM) process, etc., when integrated into the environmental conservative-adherence requirement, is essential to lead a sustainable pathway to operational excellence, and boost enterprise business competitiveness. The author in the present paper empirically examines the likeness of SMEs responsiveness toward sustainable production activities to accelerate business performance, while, promoting social, economic and environmental interest. Several mechanisms by SMEs to achieve sustainability in their manufacturing operations: the combinatory approach of lean principle to improve non-emissive, conservable energy-practice and eco-design/materials selections are reviewed. More so, the paper contributes to the literature on sustainable development for developing countries and sub-Saharan Africa in perspective. Within the different models of development and networks for improvement of the concept of sustainable industry practices, SMEs play a quintessential role. This goes to say; there is a great need to consider collaborative, Governmental/policy, and the integration of new developing Information Communication Technology (ICT) initiative to promote corporate business profitability actively and transform enterprise structures to become more resilient while functioning sustainably.

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OPEN ACCESS 022073

Sustainable Supply Chain Management: Impact of Practice on Manufacturing and Industry Development

P. Onu and C. Mbohwa

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Green supply chain, cleaner production, and re-engineering practices are nascent sustainable initiatives, combined with the integration of new and developing technologies to revolutionalize industry operations in the near future. The understanding and full application of these techniques are yet to be fully grasped, especially as it pertains to different organizations culture' operational structure and business goals. The diversity in Cyber-physical systems (CPS), autonomous vehicles, robotics, additive technologies, and alternative energy systems, in the manufacturing sector, have received extensive research over the last decade, with the promise to replace humans in future supply chain. The present paper is an exploratory assessment that evaluates sustainable technology initiatives in alignment with Sustainable Supply Chain Management (SSCM). Our inferences are based on viable implementation strategy, impacts, challenges, and the scope of applicability for increased productivity in the near future. In conclusion, we share on how the promulgation and proper management of new and developing industrial technologies are essential to maximize time, minimize cost, and improve the value of employee commitment, and customer contentment.

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OPEN ACCESS 022074

Comparative Study between TIG and MIG Welding Processes

E. O. Ogundimu, E. T. Akinlabi and M. F. Erinosho

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In this research, studies were done on the material characterization of type 304 austenitic stainless steel weld produced by TIG and MIG welding processes. This research is aimed to establish optimized process parameters that will result in a defect-free weld joint, homogenous distribution of the iron (Fe), Chromium (Cr) and Nickel (Ni) was observed at the welded joint of all the six samples. The welded sample produced at the current of 170 A by TIG welding process had the highest UTS value of 621 MPa at the welds zone, and the welded sample produced by MIG process at the welding current of 150 A had the lowest UTS value of 568 MPa. However, it was established that TIG welding process is more appropriate for the welding of type 304 austenitic stainless steel compared to the MIG welding process.

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OPEN ACCESS 022075

An Experimental Study on the Effect of Heat Input on the Weld Efficiency of TIG-MIG Hybrid welding of Type 304 Austenitic Stainless Steel

E. O. Ogundimu, E. T. Akinlabi and M. F. Erinosho

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Welding is described as the process of joining metals so that bonding can be created as a result of inter-atomic penetration. This study investigated the impact of heat input on the efficiency of the welding joints of 304 stainless steel. Three welds joint were made from two similar 304 stainless steel plates of thickness 6 mm. The tensile strength outcomes acquired showed that apex average magnitude of 672 MPa is obsessed by the sample A1 with lower thermal input. It was discovered that the percentage elongation, tensile strength and weld joint efficiency decreased with the intensification in thermal input into the weld. The average % elongation for the entire samples ranged from 28.4 % to 36.5 %. Sample A1 had the highest joint efficiency of 94.5 %. However, the optimum welding current of 190 for TIG and MIG hybrid welding of type-304 austenite stainless steel can be recommended for advanced technological applications such as aircraft manufacturing, nuclear industry, automobile industry and processing industry.

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Fabrication and Evaluation of Screw-like Fish Pelletizer

P.P. Ikubanni, O. O. Agboola, A.A. Adeleke, B.T. Ogunsemi and R. A. Ibikunle

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Good and balanced meals are required for fish to stay healthy and the production of these meals requires some machines like pelletizer. This study therefore contributes to the improvement of existing models of this machine by designing, fabricating and evaluating the performance of a new pelletizer. After fabrication, 5 kg fish feed ingredients weight was processed for 2.5 minutes in the machine in quadruplicate. The average discharge efficiency, percentage loss due to residue ingredients and production rate for the machine are 92.25 %, 7.75 % and 110.7 kg/h, respectively. The results showed that an increase in drying days led to a corresponding increase in percentage moisture content removal with a similar reduction in the weight of the pelletized fish meal. This machine will be of great assistant to medium and small-scale aquaculture farmers, thereby reducing the need for foreign sources of fish feed in fish farming sector.

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OPEN ACCESS 022077

The Effect of Varying Sand and Plastic Additives on The Mechanical Properties of Cement Matrix Tiles

O. Kehinde, O. A. Omotosho and I. O. Ohijeagbon

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The global efforts regarding polymer waste and pollution reduction in the environment through waste recycling is essential to forestall its deleterious effect on the environment. This work focused on utilizing used plastic and sand as additive in cement matrix tile production while cement and laterite quantities were kept constant. Tile specimens having a uniform thickness of 15 ± 1 mm and facial dimensions of 150 mm x 150 mm were produced in the laboratory utilizing varying quantities of sand (30, 20, 10, 0 %) and plastic (35, 45, 55, 65 %), with constant quantities of laterite (30%) and cement (5%) additives. Laterite was thoroughly mixed with sand, plastic and cement with a known volume of water in a clean bowl. The resulting mixture was then subjected to a compaction load of 25 KN in a mould to obtain cohesive material. Two sets of samples were prepared; unfired and fired sample. The unfired sample was allowed to cure after wetting for 7 days. Thereafter, the sample to be fired was heat treated in an oven at a temperature of 2200C for 35 minutes. The fired tile specimen was removed from the oven and allowed to cool down at room temperature. The specimen was then subjected to water absorption, water shrinkage, flexural and compression tests. The results obtained showed that the tile with plastic: sand ratio of 65:0 had the best water absorption and water shrinkage values of 11.4 and 5.3 % respectively. Furthermore, the mechanical tests showed that the flexural and compression tests data of 39.08 and 158.06 MPa respectively were the best when compared to other samples for the tile with plastic: sand ratio of 65:0. It was also noted that a direct relationship existed between the quantity of plastic used and the strength of tile produced. The unfired sample could not be subjected to mechanical tests as the bonds formed between the additives were weak. It is recommended that cement quantity used be slightly increased to investigate its effect on the strength of the cement matrix tile. Based on the result, it is suggested to increase the plastic content and decrease the sand content of the sand:plastic ratio to achieve a better physico-mechanical properties of tile samples

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OPEN ACCESS 022078

Impact of Varying Laterite and Cowhorn Additives on The Mechanical Properties of Cement Matrix Plastic Tiles

O. Kehinde, O. A. Omotosho and I. O. Ohijeagbon

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The transition to sustainability to meet human needs through the use of animal waste obtained from anthropogenic activities has become a subject of global importance in recent times because of its ability to preserve our environmental life support systems. This work focused on utilizing laterite and cow horn as additives in cement matrix-plastic tile production. The quantity of cement, sand and plastic used for the production was kept constant while laterite and pulverized cowhorn was varied. Produced sample dimensions were 15 mm thickness with face measurement of 150 x 150 mm. Laterite was thoroughly mixed with sand, plastic, cowhorn and cement with a known volume of

water in a clean container. The resulting mixture was subjected to a compaction pressure of 25KN to obtain a cohesive material and then fired in an oven at 2200C for thirty-three minutes. After firing the sample was allowed to cool down and then subject to physico-mechanical tests. The results obtained showed that on the flexural and compressive strength of the sample containing 45% laterite and no cowhorn had best values of 11.38mpa and 0.0037Mp respectively. The water absorption and shrinkage test for the 45% laterite no cowhorn sample with 15% pulverized cowhorn and 30% laterite was the most porous. In conclusion, increasing the cowhorn content had a direct relationship with the degree of porosity, flexural and compressive strength.

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OPEN ACCESS 022079

Investigation of Influence of Coaxial Antenna Slot Positioning on Thermal Efficiency in Microwave Ablation using COMSOL

Olumide Towoju, Felix Ishola, Timilehin Sanni and Obafemi Olatunji

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Continued development of the minimum invasive interventional technology in recent years has proven ablation therapy to be a safe and effective local treatment for cancers and has become increasingly important in the medicine field. This is the reason for its preference for treating larger tumors ahead of radiofrequency ablation. The authors numerically studied the influence of the geometry of the antenna used on the efficiency of the procedure to obtain a thermal lesion at the site of the tumor by varying the distance from the position of the end of the antenna with COMSOL Multiphysics as the modeling tool. The coaxial antenna investigated has a 1.79 mm diameter range with a center conductor of 0.29 mm diameter and Tefzel ETFE as the material of the catheter. The power of the coaxial antenna was optimized with a slot spacing of 6 mm from the tip of the antenna. The total power dissipation density, and thus the degree of thermal damage generated during the process was found to depend on the position of the slots of the coaxial antenna.

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OPEN ACCESS 022080

Alleviation of drayage truck-entry points congestion in container terminals: a review

V. I. Ihebom, R. J. O. Ekeocha and O. S. I. Fayomi

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The yardstick for deciding the limit of port is focused by three principal infrastructural assets to be specific, compartments, yards and entryways. An assortment of intrigue has been paid to enhancing billet and yard limits, presently not bounty consideration has been given to examining the entry points potential. The entryway framework is an associating hub between the landside and coastline activities in an ocean to-town esteem chain. The entry points framework requires consideration as put in Asian city, is a multi-polish parallel lining model with non-homogeneous Poisson entries. The point of this survey paper is to break down the impact of truck-entryway gridlock and conceivable practice received in easing this looming issue at a few terminals throughout the years. The characterizations for lessening drayage truck-entryway blockage at container terminal were effect of truck appointment system (TAS), reduction of system operational cost, increase of nodal productivity, decrease of truck emissions and minimization of truck turnaround time (TTT).

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OPEN ACCESS 022081

Analyzing the truck volume traffic types in tin can island container terminal (tict)

V. I. Ihebom, R. J. O. Ekeocha and O. S. I. Fayomi

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The steady rise in international trade volume has led to the high rate of utility of the marine industry. The gate system operation section of the marine terminal is a very pivotal aspect as it helps in the completion of the supply chain network. The drayage activities of pickups and delivery are single or double move operations at the terminal in order to meet customer's target. These operations are carried out by different types of trucks traffic: inbound and outbound trucks. This paper aims at investigating the flow pattern of these inbound and outbound trucks and their respective subdivision frequency at TICT in the year 2018. For the inbound trucks, 501-550 truck distribution had the highest interval with 34.5% as a daily percentage arrival within the operating hours. While with two-week interval, EMTIN (empty-in) dominated with a higher peak and CHIN had the least turn-out than the others inbound subdivisions. While for the outbound trucks pattern, it revealed that LDOUT (load-out) was domineering with a greater peak and the least was CHOUT (chassis-out). The rate of inbound to outbound truck volume for that year depicts the state of the countries dependency.

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OPEN ACCESS 022082

Influence of 0.2% fe addition on zirconium conversion coating on aluminium alloy

M. Oki, A.A. Adediran, B.T. Ogunsemi and N. Egiebor

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Conversion coating on aluminium/0.2%Fe alloy developed from a zirconium nitrate/fluoride solution has been examined with scanning electron (SEM) and transmission electron microscopes (TEM) with attached energy dispersive X-ray (EDX) facilities. Zirconium-rich islands of thicker sections were observed in the SEM. The thin sections from the transmission micrographs revealed undulating metal/coating and coating/solution interfaces. This is consistent with anode/cathode reactions in the formation and growth of conversion coatings on metals, especially aluminium alloys. The coating comprises of zirconium rich surface which is contaminated or otherwise with aluminium and other species from the coating solution.

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OPEN ACCESS 022083

Design and Fabrication of a Wet Mechanical Brushing Unit for Lye Pre-treated Cassava Root

S.T. Oyedele, P.O. Ngoddy, O. Kilanko and R.O. Leramo

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The design and fabrication of a wet mechanical brushing unit for lye pre-treated cassava root was described in this paper. The objective of this work was to determine the time of reaction, the temperature and the concentration of sodium hydroxide solution that will effectively digest the peel and also the speed of the machine, output size, efficiency of peeling and tuber loss. It was determined that using lye solution to digest cassava root peel depends on the severity of the concentration of the solution and the time of root immersion. From the preliminary labouratory tests carried out, the optimal combination of process parameters in terms of concentration, temperature and time of root immersion for UMUCASS44 in lye are 20%, 60°C and 15 minutes, respectively. These values are sufficient to digest the peels of the root for enhanced brushing.

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OPEN ACCESS 022084

Performance of Cassava Peeling Machines in Nigeria: a Review of Literature

Oyedele Tobiloba, Kilanko Oluwaseun and R.O. Leramo

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A review is done on the indigenous cassava peeling machines made in Nigeria. Cassava is a very important cash crop that can be processed into more than a thousand products. One of the most important unit operations in cassava processing is peeling and its importance can never be overemphasized. Some of the other unit operations in cassava processing have already been successfully mechanized. To all engineers who have been involved in equipment design of cassava globally, cassava peeler has remained a serious problem to them. This study presents the functionalities, prospects, performance assessments and limitations in some of the indigenous cassava peeling machine. Some of the machines that have been made are the knife edge type peeler, double and single gang peeler, automated peeler, etc. Evaluated in this paper are there unique advantages and functional parameters, such as the speed of the machine, output size, efficiency of peeling and tuber loss. The machines have an operational speed ranging from 40 to 700rpm, output capacity ranging from 10.4 to 725kg/h, peeling efficiency ranging from 48.8 to 92.0% and tuber loss ranging from 2.5 to 42%. Peeling efficiency decreases as the speed of all the machines evaluated increase. There was also an increase in the loss of tuber and output capacity as the speed of the machines increases. With an improved cassava peeling process, there is a possibility that cassava cultivation will be encouraged and other uses of cassava will be harnessed. Part of what will be affected are better product quality as there will be minimum loss in tubers and an increased processing time.

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Information And Communication Technology Adoption And Innovation For Sustainable Entrepreneurship

J. O. Ejemeyovwi, E. S. Osabuohien, E. K. Bowale, O. O Abuh, J. P. Adedoyin and B. Ayanda

− Hide abstract PDF

ICT adoption has experienced an increasing trend in the past two decades and simultaneously, achieving sustainability in entrepreneurship is the major goal of every entrepreneur; this study seeks to empirically investigate ICT adoption's contribution to sustainability in entrepreneurship. The

objective of this study is to examine the relationship between ICT adoption and sustainable entrepreneurial development in Western Africa. Panel data on ECOWAS countries were collected and estimated using econometric tools for the purpose of the study. The findings show that a positive statistically significant positive relationship exists between ICT adoption and sustainability in entrepreneurship. The outcome of this study is expected to have microeconomic and macroeconomic implications for sustainability in entrepreneurship within and outside ECOWAS.

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OPEN ACCESS 022086

The limitations and opportunities to use lean based continuous process management techniques in Nigerian manufacturing industries – a review

S. C. Nwanya and A. Oko

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The philosophy governing mass production is still a dominant philosophy in industries situated in Nigeria. But, lean concept has long succeeded mass production in most developed economies. This review exposes the constraints and potential benefits of using lean techniques in the transformation of industries in Nigeria based on field experiences elsewhere, where those techniques were used. The review uses method of searching questions or keywords for gathering useful information on the subject at hand from different journals, conferences papers, professional articles, and student thesis, spanning over the period of 1988-2018. However, in evaluating the prospects of implementing lean concepts, the review identified a number of tested lean techniques for possible application in the process and non-process industries. There is suggestive evidence from the article review that no Nigerian small or even large-scale business enterprise is practicing lean. It is expected that transition from the traditional method of manufacturing to lean, if implemented with enabling techniques, will engender sustainable manufacturing and higher productivity for industries in Nigeria.

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OPEN ACCESS 022087

Corrosion Inhibition Comparison of the Effect of Green Inhibitor on the Corrosion Behavior of 316L and 904L Austenitic Stainless Steels in Chloride Environment

O. Sanni, A. P. I. Popoola and O. S. I. Fayomi

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Corrosion behavior of austenitic stainless steels type 904L and 316L in 3.5% NaCl solution was studied using eggshell powder (ESP) as an inhibitor. The experimental testing method was carried out using gravimetric and potentiodynamic polarization techniques. The testing results showed lower corrosion rate values with ESP, indicating the stainless steels corrosion resistance was influenced by the inhibitor and the chemical composition of 904L and 316L respectively. The morphological changes on stainless steel are checked with and without ESP, at its optimal concentration. Stainless steel 904L has higher impedance magnitude compared to stainless steel 316L at all concentrations of inhibitor studied in the sodium chloride solution. It was concluded that ESP is mixed type in nature; this conclusion was achieved by comparison of changes in the cathodic and anodic Tafel slope values.

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OPEN ACCESS 022088

Pitting corrosion evaluation: a review

K.V Akpanyung and R.T Loto

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Pitting corrosion is an insidious localized form of corrosion causing much devastating destruction to structural members such as stainless steel in chloride environment. This paper gives a review of the mechanism processes of pitting, stages, factors facilitating pitting corrosion, techniques of evaluating pitting corrosion and some research work on pitting corrosion. The rudimentary knowledge of the mechanisms of pitting corrosion from this work will be of assistance to the selection process, specification and the use of stainless steels and other structural members.

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OPEN ACCESS 022089

An Overview of Ammonium Chloride (NH_4Cl) Corrosion in the Refining Unit

K.V Akpanyung, R.T Loto and M.A Fajobi

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Ammonium chloride is a destructive agent of localized corrosion which poses devastating threat to refining structure integrity and the safety of the refinery processes. Ammonium chloride is an underdeposit corrosion commonly found in overhead equipment and piping for crude and hydroprocessing units. This form of insidious form of corrosion had caused severe fouling that posed negative impact on the operating reliability of various processing units. This review addresses the corrosion mechanism of ammonium chloride, affected materials and equipment, Environmental factors for its impact, thermodynamic behavior of a wet ammonium chloride system, some case studies of ammonium chloride and the preventive measures to mitigate its effect.

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OPEN ACCESS 022090

Analysis and Reduction of Waste in Beverage Industries Using Pareto Principle and Value Stream Mapping

A.U. Samuel, F. Oyawale and O.S.I Fayomi

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Elimination of waste has been the focus of beverage industries in Nigeria and in so many parts of the world. A lot of tools have been employed in the analysis and reduction of waste without the in-depth studies of the origin of these wastes. This present work carried out in-depth studies on the cause of waste in the beverage industry concentrating on canned beverages. Primary data were collected from a beverage industry, assessment of the production line and packaging section were carried out and the managers and employee were interrogated so as to obtain information used for this research. The data were analysed using the Pareto principle and the information obtained was used to design the current and future state mapping of the industry. The Pareto chart shows that production line and distributors constitute more than 90 % of the channel of waste while the in-house and transit waste constitute less than 10 %. The future state mapping proposed a reduction in the manpower from 17 to

12 which represents 29.41 % reduction and this will go a long way to affect the industries annual expenditure. The lead time was also reduced by 15 seconds, although this time seems small, the accumulation of this time is a whole lot in production.

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OPEN ACCESS 022091

Performance Evaluation of a Centrifugal Pump with different Impeller Materials

P. O. Babalola, J. E. Omada, O. Kilanko, S.O. Banjo and O. Ozuor

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Many factors affect the performance characteristics of a pump. One of these is the impeller material. This paper is on the effect of impeller material on the operating characteristics of a centrifugal pump. The impeller materials used were cast iron, bronze and zinc. Cost, pumping efficiency, pressure head and power consumption are the factors that were taken into consideration. The results from the test, showed that the impeller made of zinc material was found to be more efficient (48.24%) and required the most power (3.38bhp). The zinc impeller was the least expensive to manufacture and pumped better head. The zinc impeller however failed at (very) high pump speed due to the fact that its strength could not match up with the pump speed. The cast iron impeller on the other hand, required the least power (0.86bhp) to run but pumped the least head (6.25m) and was more efficient (46.35%) than the bronze impeller; this was majorly due to cavitation and friction losses. The bronze impeller pump was the least efficient (38.79%), the most expensive to manufacture but pumped more head (8.50m) than the cast iron impeller and required more power (2.32bhp) than the cast iron impeller.

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OPEN ACCESS 022092

Corrosion Inhibition Efficiency of *Terminalia Catappa* Leaves Extracts on Stainless Steel in Hydrochloric Acid

J.O. Madu, C. Ifeakachukwu, U. Okorodudu, F.V. Adams and I.V. Joseph

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Corrosion inhibition potential of *Terminalia catappa* leaves extract was investigated using Grade 304 austenitic stainless steel in 1.0 M HCl solution with a view to finding natural, eco-friendly, low-cost and readily available corrosion inhibitor. The corrosion inhibitory characteristics of the extract were investigated by utilizing gravimetric measurements and microstructural surface changes obtained from scanning electron microscopy (SEM). This study was carried out in the absence and presence of *Terminalia catappa* inhibitor (0.01-0.09 g/ml) and temperatures (30-50 °C). Data obtained from weight loss experiments and adsorption isotherms (El-Awady, Temkin, and Freundlich) indicated that *Terminalia catappa* leaf extract repressed the corrosion of stainless steel in acidic media by 96.8 % at 30 °C and conforms to physisorption adsorption mechanism. Inhibition efficiency (% IE) of the extract improved with increasing extract concentration but declined with rising temperature.

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OPEN ACCESS 022093

The Use of Solid Fuel for Biogas Production in a Biodigester

G.A Soliu and C. Onunka

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Biogas production technology is a technology with great potential and has the potential to influence the type of energy mix available within a given community. Biogas was produced by the microbial digestion of organic matter in the absence of air in a bio digester. Cow dung was used as the solid fuel necessary for biogas production. Approximately 40kg of cow dung was collected for the purpose of this study. The cow dung collected were sun dried and crushed manually to ensure homogeneity before mixing with water to produce biogas by anaerobic decomposition. Cow dung and water were mixed in the ratio 2:1. The mixture was homogenized with manual stirrer. A digester of 400 liters' capacity was designed and the inner part of the digester was covered with nylon to ensure proper cow dung fermentation. A plastic pipe situated at the top was connected to the digester to serve as gas outlet of the digester and the other end of the plastic pipe was connected to an inflatable tube for gas storage. The digester was stirred three times a day to avoid scum formation in the digester. There was less biogas produced at the initial days. The minimal production of biogas at the initial three days was mainly due to the slow microbial growth. There was a substantial increase in biogas production from the 9^{th} day. The increase in biogas production was due to the exponential growth of microbial activity in the digester. Sudden decreases in biogas production was due to unregulated pH. in the digester. The unregulated pH in the digester increased the concentration of ammonia nitrate. Ammonia nitrate can inhibit the process of biogas production.

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OPEN ACCESS 022094

A Sustainable Industrial Development Approach: Enterprice Risk Management in View

P. Onu and C. Mbohwa

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The need to improve upon organizational performance and operational effectiveness call for sustainable industrial development and Risk management initiatives to deliver new corporate business models. An organizations interest to integrate and implement strategic approaches to identify, access and prepare against uncertainties through its business activities hold more benefits as per increased productivity. The authors' investigation via an in-depth interview comprising of the senior and mid-level management staff of a steel-product manufacturing company in Nigeria subscribes to a single case study. We explore the implementation challenges of Enterprise Risk Management (ERM) in the supply chain of manufacturing firms. The research infers the case firm; having implemented and succefully demonstrated the ISO90001 and ISO13000 (quality and environmental standard), struggles to register any benefits with the ERM-ISO31000 operative. The findings further point at the managerial disconnect to effectively communicate the objective and the changing cultural practice. Also, notable was the worker's perception of lacking the necessary information communication assistance to influence the ERM execution. The investigation contributes to the case firm understading of ERM and successful approach towards its implementation.

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OPEN ACCESS 022095

Reinforcement bar Corrosion - Causes and Management

M. Oki, S.A. Akintola, A.A. Adediran, P.P. Ikubanni and B. T. Ogunsemi

Concretes are composite materials which decay as a result of steel corrosion in concrete structures is mostly accelerated in environments laden with chlorides and industrial effluent gases as well as harsh chemicals employed in and those generated from wastes in agricultural industries. This review summarises the effects of various environmental pollutants which promote deterioration of concretes with resultant corrosion of reinforcing bar (rebar). An overview of traditional and current methods for significant reduction of this mode of material deterioration is described. Discussions on management tools for rebar corrosion in agricultural and marine environments have been highlighted. Repair methods include the traditional application of patch repair mortar which has been modified with polymeric materials to improve adhesion and reduce porosity. The use of cathodic protection system to reduce rebar corrosion to its barest minimum has gained currency. Attention should be directed at corrosion reduction practices at the design and planning stages as well as modification concrete mixes with modified agricultural wastes/products and polymers.

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OPEN ACCESS 022096

Effect of Car-Ownership and Income on Work and Non-Work Trip of Low-Income Households

Busari, O. Adebayo, A. Samuel, O. Kehinde, O. Joshua and A. Olaniyi

This research assessed the influence of car ownership on both work trips and non-work trips in a semi urban industrial settlement, Ota, Ogun State. This was achieved with the distribution of One thousand five hundred (1500) question forms for nine months in the study area. Information on the socio-economic parameters, car ownership, modal split and volume of trips of respondents were analyzed to develop a multiple regression model for the analysis. This was done for for all trip types (both work and non-work trip). The data was analyzed using SPSS version 23 software. The linear regression model explains 70.2% of the variance of the data. The positive value of the model coefficient showed that the higher the income and car ownership, then the higher the volume of trip. This analysis was done on the aggregate level (work and non-work trip). However, the trip is expected to go up by 8.4 unit when car ownership goes up by 1 unit. The coefficient revealed that car ownership had a higher effect on trip than income. The outcome of the research will help policy makers and transportation planners in order to understand the travel behaviour of the study area and similar cities in the world for sustainable transportation and effective transportation planning now and in the foreseeable future.

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OPEN ACCESS 022097

Government Policies and Engineers' Roles in Facilitating Nigeria's Transition to Circular Economy

I.S. Dunmade, S. Oyedepo, O. Fayomi and M. Udo

There are ongoing global efforts at changing from the traditional linear economy to a circular economy. Nigeria as the largest economy in Africa cannot afford to lag behind. This study evaluated potential impacts of the current Nigerian resource use and exploitation policies as well as engineering practitioners' training and practices on Nigeria's transition to circular economy. The study further attempted to identify changes in government policies and engineering training and practices that would be necessary to facilitate Nigeria's successful transition to a circular economy. This paper is based on a desk and literature review, a web-based research on government policies, engineering training and engineering practices in Nigeria. Contributions of this study include provision of insights to the government officials on regulations that need to be improved to facilitate Nigeria's transition to circular economy. It also provided agencies regulating engineering education and engineering practices in Nigeria opportunities to see areas of deficient that may need to be improved for successful transition to a circular economy

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OPEN ACCESS 022098

Organisational Branding, A Strategic Tool for Engineering Customer Satisfaction in Service Industry: A Study of Selected Banks

Uchechukwu C. Okafor, Rowland E. Worlu, James N. Obi, Alice I. Ojile, Josephine E. Irawor, Iboro P. Udoh, Dorcas K. Sunday, Joy O. Solesi and Remilekun B. Akindele

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Effective brand strategies cannot be developed without the customers in mind, hence the need to examine how brand strategies affect the behaviours of these customers to yield a good result. The objective of this study is to evaluate the impact of organisational branding on the levels of customer patronage. A descriptive and survey design was adopted for the study. The population for this study consist of customers from Wema and Zenith bank within Lagos metropolis. The questionnaire was used in eliciting information from respondents, which contained two sections. Two research questions and hypotheses were raised and tested. The data collected was analysed using Statistical Package for Social Sciences (SPSS version 20.0), for frequency distribution. Further analysis was carried out using linear regression and correlation analysis. From the findings made in the study, there is a significant role played by brand identity in meeting customer expectation and there is a significant effect of brand culture on customer satisfaction. It was recommended that management should be conscious of their peculiar corporate identity once established in order to capitalize on their strengths and opportunities, as well as improve on their weaknesses and address their threats in good time and Managers should strive to create a peculiar brand culture in line with their given brand identity, as the creation of a strong brand culture will enable the staff of the organisation to deliver quality service for good customer satisfaction.

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OPEN ACCESS 022099

The Impact of Passive and Active Teaching Methods on Students' Learning Among Secondary School Students in Yenagoa, Bayelsa State

Fapohunda Funmilayo Diepreye and Jonathan Adedayo Odukoya

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The purpose of this study is to find out the impact of passive and active teaching methods on students' learning in Yenagoa, Bayelsa State. Pre-test post-test experimental design was adopted for this study. Two hundred secondary school students were randomly selected for this study (X = 14.42; SD = 0.91). The sample was made of 72 males and 124 females. Data was collected via administration of achievement test in Biology with specific focus on Osmosis and Diffusion. ANOVA was used to analyse the data. The findings showed that the overall, active teaching methods have a significant impact on students' learning than the passive teaching method at p<.05 level for the four conditions (F (3, 192) = 162.03, p=.000). Based on these finding, it was recommended that the Ministry of Education should embark on enlightenment campaign on the need for teachers to employ effective teaching methods in classroom.

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OPEN ACCESS 022100

Effect of Ambient Temperatures on an R134a Domestic Refrigerator Retrofitted with R600a and LPG Refrigerants

O.R Olatunji, O.S. Ohunakin and D.S. Adelekan

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The effect of ambient temperatures (19, 21, 23 and 25 °C) on energetic performance of an R134a domestic refrigerator retrofitted with varied mass charges (40, 50, 60 and 70g) of R600a and LPG (60/40 Propane-butane mixture) refrigerants was studied. The R134a domestic refrigerator was slightly modified with valves and integrated with appropriate pressure gauges, digital thermocouples and a watt meter to monitor the pressures, temperatures and the energy consumptions of the refrigerants within the system in the ambient conditions. Performance test investigated at steady state were pressure ratio, energy consumption, discharge and cabinet temperatures respectively. In conclusion, results showed that the retrofitted hydrocarbon refrigerants could be suitable replacements in all regards, provided adequate optimization is done.

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OPEN ACCESS 022101

Performance of a Limited Charge of R600a and LPG Refrigerants in a Domestic Refrigerator Using R134a Refrigerant in Different Ambient Conditions

O.R Olatunji, O.S. Ohunakin and D.S. Adelekan

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In this work, a slightly modified 100g R134a domestic refrigerator was retrofitted with limited mass charge (30g) of R600a and LPG refrigerants and tested in different ambient temperature conditions (19, 21, 23 and 25 °C). The test rig was fitted with appropriate instrumentation for experimentation. Performance characteristics investigated with the test rig at steady state include evaporator air temperature, discharge temperature and power consumption. Results showed that the retrofitted hydrocarbon refrigerants in the system at the ambient conditions gave power consumption, discharge temperature, condensing pressure lower by 15 – 45 %, 16 – 30 % and 25 – 62 % than R134a refrigerant. In addition, the cabinet temperature of the system with the hydrocarbon refrigerants were higher than R134a by 10 - 60 %. In conclusion, the investigated energetic characteristics of the system

improved with reducing ambient temperature and all conditions with infused hydrocarbon refrigerants attained cabinet temperatures lower than -3 °C in accordance to ISO 8187 recommendation for domestic refrigerators.

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OPEN ACCESS 022102

Index Properties of Aluminum Dross Modified Pavement Geo-material

Ayobami Busari, Funmilayo Joseph, Samuel Ajayi, Tolulope Alayande, Joseph Nwachukwu and Deborah Agbama

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The recovering of aluminium from aluminium dross waste involves so much cost and energy. As a result, there is a need for its utilization as an engineering material. This research assessed the suitability of aluminium dross waste in improving the index properties of pavement geomaterial. Aluminum dross, a solid waste from aluminum industry was added at 4%, 8%, 12%, and 16% by weight of the lateritic soil sample. Sieve analysis, Atterberg limit, specific gravity test, Compaction test, and California bearing ratio (CBR) were carried out on the samples. The increased addition of aluminium dross to the sample reduced the plasticity index from 15% to 13.8%, which showed an improvement in the soil sample. Also, the CBR value increased from 51.22 to 64.32 with the addition of aluminum dross which signifies increased strength of the stabilized soil sample. The increase in strength of the aluminum dross stabilized soil is due to the good binder–matrix interaction of aluminum dross and the soil. The result of this experimental research showed that the utilization of aluminium dross in improving the strength properties of pavement interlayer proved to be a sustainable alternative.

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OPEN ACCESS 022103

Assessment Of Air Pollution In A Semi-Urban Industrial Cluster

A. Ogbiye, K. Adekalu Kenneth and A A. Busari Ayobami

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This study assessed the air pollution in a semi urban industrial cluster in Nigeria with special focus on the cement industry. The major pollutants considered in this research were Suspected Particulate Matter (SPM), Oxides of Nitrogen, Sulphur di Oxide (SO_2), Carbon Mono Oxide (CO), Lower Explosive Limit (LEL), Hydrogen Sulphide (H_2S) and Noise. Industrial Scientific ITX 6 multi-gas analyzer, Land Duo Emission Analyzer, Handheld Aerosol Monitor Model 1055 and Quest Sound Level Meter, Model 2400 were used in the analysis. Also, empirical investigation, as well as reconnaissance surveys were carried out by the administration of well-structured residential and industrial question forms. The result of the analysis showed that there was a 3.1% reduction in the level of SPM measured with lower value than the required limit for 8 hours exposure. Reduced levels of CO and CO_2 were observed from the average readings taken from 2014 and 2015 with 24.81% and 31.4% reduction in the average reading respectively for two consecutive years. Noise level detected at the several locations varied from 49.8 to 69.6 dβ.The outcome of the research showed that appropriate measures must be put in place by industries to reduce air pollution now and in the foreseeable future.

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OPEN ACCESS

022104

Reality of Changing Oil Prices and its Impact to Developing Oil Producing Nations

D. Daramola, O. S. I. Fayomi, I.G. Akande, M. John, O. Agboola and M.O. Udo

− Hide abstract PDF

In recent years the fluctuation in fuel prices coincided with the global economic depression of 2008, further studies indicate that when production of crude oil is more than the demand of the crude oil, crude cost would reduce whereas if there is little supply of crude oil and there is growing demand of crude oil the cost of crude would increase. In this review we explore the various conditions that influence the fluctuation of crude oil, the impact this conditions have to the global price of crude oil and it relation to developments of certain economies as specified. There was found to be correlation between crude oil price increase and an increase in gross domestic product (GDP) of developing oil producing nations also there was found to be a fall once there is a reduction in crude price. This is dependent on if the nation in question is crude oil based economy whereas if the economy in question is more diverse its effect on the GDP wouldn't be as pronounced.

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Papers

One of the ways to combat food insecurity as world population rises is the reduction of food losses. Drying is one of the oldest methods of food preservation and hence reduces food losses. Solar drying uses energy from the sun and an absorber material to carry out drying of produce. In this project, a solar dryer was designed, constructed and its performance was evaluated. The dryer has overall dimensions of 1000mm by 410mm by 700mm. The inner part of the dryer compartment was lagged with aluminum foil to act as an insulator. The solar collector made of galvanized sheet and the glass on top of it have an area of 800mm by 380mm. Fresh scotch bonnet pepper was used as the produce of choice. The pepper was dried in 2 experiments for 3 weeks each. 200g of pepper was used and weighed to measure weight loss periodically. Temperature and humidity of the drying chamber and the surrounding were measured with data loggers throughout the periods of the experiments. The results showed that the ambient temperature during the experiments was higher than the temperature of the drying chamber in the early hours of the morning between 4am and 10am. During every other period, the temperature in the drying chambers was higher than the ambient temperature. An average moisture content of 81.3% w.b. was removed from the pepper during the experiments. The average efficiency of the dryer was 28.4%.

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Due to the aspirations of various institutional stakeholders clamoring for improvement in the quality of education in their various institutions, the concept of total quality management has gained so much attention to this regard. In the recent time, several emphases have been made on the need for quality improvement and efforts are been put in place on the possible ways of increasing the standard of education globally. The productivity of any tertiary institution, especially the Engineering colleges is centered on the quality culture of such institutions, also, the customer's satisfaction is another thing to put into consideration, to achieve the desired productivity. Generally, there are some constructs which are the major critical success factors that enhances quality improvement in any organization, customer satisfaction has been identified as another important factor to put into consideration to achieve optimum quality of products as well as services. This paper gives an insight on how the implementation of Total Quality Management in an Engineering educational system can aid the Quality of Engineering Education.

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OPEN ACCESS 032003

Solar Powered Microcontroller-based Automated Irrigation System with Moisture Sensors

C. A. Bolu, J. Azeta, F. Alele, E. O. Daranijo, P. Onyeubani and A. A. Abioye

In traditional irrigation approach where water is irrigated on the land without adequate control measures, crops sometimes undergo increased stress with disparities in the soil moisture which consequently reduce the crop performance and output. In this paper, we come up with a prototype to increase crop yield while considering adequate agricultural water management and labour reduction, by adequate control measures in the irrigation process. An automatic irrigation system is designed and developed by integrating several hardware and software features. The system is designed to determine when exactly the soil of crops need water and deliver a controlled amount of water to the root zone of the crops based on the soil moisture state. With the microcontroller, the data obtained from the soil at the roots of the crops will determined how much water for irrigation is needed at a point in time, and supplies it, thereby incorporating good water management practice. The system is designed to run 24/7 on renewable solar energy.

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OPEN ACCESS 032004

Analysis of Compressive Strength of Existing Higher Educational Institutions (HEI) Concrete Column using a Schmidt Rebound Hammer

B F Ogunbayo, C O Aigbavboa and O I Akinradewo

The Schmidt rebound hammer is principally a surface hardness tester with an apparent theoretical relationship between the strength of hardened concrete block and the rebound number of the hammer. This study analysed compressive strength of some selected concrete columns of Civil Engineering block at Covenant University Ota, using the Schmidt rebound hammer. It is aimed at determining variation in the concrete column strength of the HEI building in relation to standard

compressive strength required of a concrete column. Data for the study was collected by carrying our Schmidt rebound hammer test (non-destructive test) on the concrete column within the study area and the rebound value (R) was measured to determine the present compressive strength of the concrete column. In carrying out this experiment, the standard experiment procedure of the Schmidt hammer test was followed. The analysis of the performed nondestructive test on the HEI concrete column was presented through tables and figures. The result of the study shows that there is variation in the compressive strength of the HEI concrete columns sampled using Schmidt rebound hammer test. The result indicated that the average compressive strength gotten through the rebound values of the sampled concrete columns compressive strength falls within the minimum required strength between 25N/mm^2 and 30N/mm^2 expected of a concrete column of an existing structure. The study therefore, concluded that the concrete columns of the HEI building sampled is safe, stable and it can satisfy the need for which it was built. Furthermore, because of it stability it can resist the load coming to it and this make it habitable for learning.

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OPEN ACCESS 032005

Correlation Between Manufacturing Sectors and Foreign Direct Investment

A. Afolabi, O. T. Laseinde, I.J. Oluwafemi, O.D. Atolagbe and J.F Oluwafemi

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The manufacturing sectors of nation's economies have without doubt been noted as the chief driver of economic growth the world over. The connection between the Nigerian manufacturing sector and foreign direct investment (FDI) was assessed in this work. The study, in order to empirically examine how the variables are related in the long term and short term, utilised time series data spanning 36 years, while the autoregressive distributed lag (ARDL) and co-integration technique were used. From the result, it is seen that the dependent variables explained R^2 of 97% of the variations in manufacturing sector indicators (MFI), while Foreign direct investment, (FDI), Inflation rate (INF), government expenditure (GOE), and money supply (MSP) represent the independent variables. One of the recommendations of the study is that the federal government should consciously increase amount of foreign direct investments (FDI) made available to this all-important sector-manufacturing sector to boost its efficiency especially with respect to percentage impact on GDP and employment generation in Nigeria.

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OPEN ACCESS 032006

Application of Mechatronics in Agriculture: A review

J. Azeta, C. A. Bolu, F. Alele, E. O. Daranijo, P. Onyeubani and A. A. Abioye

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Mechatronics has found quite a number of useful applications in agriculture. Agriculture as one of the oldest industries, dating as far back as the nomadic age originally depended solely on human effort, then apprehended animal labour, and then came mechanical advances such as diesel/steam-engine tractors and mechanical tools with hydrostatic power which needed control. The answer to unresolved problems relies on more advances that necessitate the replacement of human intellect to meet the requirements for superior autonomy in more indefinite and unstructured environments.

Promising disciplines in this framework include Mechatronics, Large-scale optimization and Complex system automation, and our focus is on the advancement of irrigation system. Some of the applications of mechatronics in agriculture and their processes are discussed to gain insight on the state of the art, advantages and weaknesses of several methods employed.

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OPEN ACCESS 032007

Evaluation of Wood and Plastic Formworks in Building Construction Industry for Sustainable Development

W. B. Kareem, R. O. Okwori, H. O. Abubakar, A. Nuhu and E. I. Dickson

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This research work assessed wood and plastic in building construction. The study was a descriptive survey design and as such made use of questionnaire with 42 items. The Population of the study was 110 respondent which include 40 building professional and 70 non-building professional. The data were analyzed using mean and standard deviation. T-test was used to test the null hypothesis at 0.05 level of significant. The finding of the study shows that plastic work form can be used for casting slab, concrete wall among others. The finding also revealed some factors that determines the selection of form work such as climatic condition, labour efficiency and that plastic formwork saves cost as a result of long reuse period. It is therefore recommended that; plastic and wooden formwork should be integrated often in the casting of slabs, beam and columns without discrimination, proper adherence to standards and specifications for use of any type of formwork, there should be large scale production of plastic formwork to conserve forest and wood, factors to be considered in the selection of formwork should not be ignored, there should be proper weighing of the advantages and disadvantages of each type of formwork relating to the scale of construction before the choice of any formwork.

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OPEN ACCESS 032008

Wind Energy Systems for Omu Aran, Kwara State, Nigeria

D. C. Uguru-Okorie, I. Ikpotokin, C. O. Osueke and O. Olawale

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The quest for energy from renewable and sustainable sources has led to the investment on exploration and installations of wind energy systems to harness energy from wind for use by mankind. Various wind energy systems exist and they are quite expensive. Selections of appropriate systems for installation are dependent on the wind power available in a location. It is therefore important that proper wind assessment is done before investments on infrastructures for harnessing wind power are put in place. Wind data between 2014 and 2018 were obtained from the Landmark University Weather Station in Omu Aran and the pattern of wind speed distribution in the location over the years in focus were determined by the Weibull function. The power law was used to estimate the wind speeds at heights of 10 and 20 metres respectively. Recommendations on appropriate wind energy systems suitable for Omu Aran region were made based on the wind speed pattern.

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OPEN ACCESS 032009

Analysis of a Multi-Stage finned PCM based storage system for Solar Thermal Power Generation

Mubarak Danladi Muhammad

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The sensible storage system utilizing a hot and cold tank is the current commercial technology for solar parabolic trough thermal plants. This technology is very expensive, because of its large storage material requirement, two tanks and heat exchanger. It also has high parasitics. The use of phase change material (PCM) offer higher storage capacity per unit mass. The wide operating temperature range (about 100°C) in parabolic trough plants meant that many PCMs with different melting points in series must be used. Investigation of using five PCMs with different melting point resulted into a storage system with storage material inventory higher than that of the two-tank system due to slow discharging rates. In this study, a multistage finned latent heat storage system model was developed and performance analysis was conducted. A model was developed for a four (NaNO3, KNO3/KCl, KNO3 and KOH PCMs) and five (NaNO3, KNO3/KCl, KNO3, KOH and $MgCl_2$/KCl PCMs) stage cascaded storage system. Various charging and discharging mass flow rates were simulated and for each mass flow rate, the length of the storage system that will satisfy the boundary conditions of the plant at a periodically balanced state was determined. Results showed that using A HTF charging and discharging mass flow rate of 0.025kg/s and 0.03kg/s respectively has the highest percentage phase change of 70% meaning better utilization of storage material. Also the four stage cascade was found to have a percentage phase change of 56% which is lower than that of the five stage cascade. Considering a capacity of 875MWh_{th}, which is the capacity suitable for the 6 hours operation of a 50MW_e parabolic trough plant, a storage material inventory of about 25, 000 tonnes is required corresponding to a net volumetric specific capacity of 72.8 kWh/m^3 which is about 2.5 times that of the existing two tank system. This clearly shows the higher storage density of the multi-stage finned LHS system. The LHS system is passive and thus has very low parasitics compared to the two-tank system.

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OPEN ACCESS 032010

A Mini Review of Trends towards Automated and Non-Invasive Techniques for Early Detection of Lung Cancer: From Radiomics through Proteogenomics to Breathomics

Funmilayo S. Moninuola, Emmanuel Adetiba, Oluwadamilola I. Oshin, Anthony A. Atayero and Ademola Adeyeye

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Carcinoma of the Lung is one of the most common cancers in the world and the leading cause of tumor-related deaths. Less than 15% of patients survive 5 years post diagnosis due to its relatively poor prognosis. This has been ascribed to lack of effective diagnostic methods for early detection. Different medical imaging techniques such as chest radiography, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) are used in routine clinical practice for tumor detection. These techniques are medically unsatisfactory and inconvenient for patients due to poor diagnostic accuracy. Endobronchial biopsies are the gold standard for diagnosis but have the inherent risk of full or partial invasive procedures. Thus, diagnostic technology that uses data mining algorithms with medical image analysis, generally known as radiomics emerged. Radiomics extracts complex

information from conventional radiographic images and quantitatively correlates image features with diagnostic and therapeutic outcomes. In spite of the benefits, radiomics is prone to high false positives and there is no established standard for acquisition of parameters. Further efforts towards outcome improvement led to the proteomic and genomic (proteogenomic) approach to lung cancer detection. Although proteogenomic has a diagnostic edge over traditional techniques, variations in bio-specimen and heterogeneity of lung cancer still possess a major challenge. Recent findings have established that changes normally occur in the gene or protein due to tumor growth in the lungs and this often leads to peroxidation of cell membrane that releases Volatile Organic Compounds (VOCs) through the breath of Lung Cancer patients. The comprehensive analysis of breath VOCs, which is tagged Breathomics in the literature, unveils opportunities for noninvasive biomarker discovery towards early detection. Breathomics has therefore become the current pace-setter in medical diagnostics research because of its non-invasiveness and cost effectiveness. This paper presents a mini survey of trends in early lung cancer detection from radiomics, through proteogenomic to breathomics.

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OPEN ACCESS 032011

Creation of a Nigerian Voice Corpus for Indigenous Speaker Recognition

Adekunle A. Akinrinmade, Emmanuel Adetiba, Joke A. Badejo and Aderemi A. Atayero

One of the goals of Word Bank's Identification for Development (ID4D) is the realization of robust digital identification systems as a means of sustainable development priority. ID4D's most recent report shows about 1.1 billion of the world's population are yet to be identified for development. Africa represents about half of that number while Nigeria represents about a quarter of Africa's share. Biometrics is the state-of-the-art approach for identification using human behavioral and/or physiological digitally calibrated traits and one such trait is the voice. The backbone of biometric research is the database employed in the design of biometric systems. Although many voice databases are publicly available such as the THCHS-30 for Chinese and Microsoft Indian language Speech Corpus for Indians, none is currently publicly available or free for Nigerians. The creation of such an indigenous database (or corpus) can open doors to Nigerian automatic speaker recognition as well as for indigenous language, ethnicity, gender, age group and emotion classification amongst others. This work is a first step in the direction of creating a Nigerian Voice Corpus (NVC) to aid indigenous voice biometric research. A voice corpus of popular Nigerians was created by curation of audio samples of 14 women and 23 men from YouTube. The corpus contains 10 different samples of 5 seconds duration for each individual resulting in a total of 370 samples. The created corpus was used to carry out speaker recognition experiment by dividing the audio samples into 25ms non-overlapping frame durations. Silent frames were excluded using short-term spectral energy threshold for Voice Activity Detection (VAD). This was followed by extraction of Mel Frequency Cepstral Coefficient (MFCC) as descriptors to discriminate different speakers using Support Vector Machine (SVM) with median Gaussian function. An overall recognition accuracy of 93.24% was achieved demonstrating the feasibility and research potential in this direction.

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OPEN ACCESS 032012

Experimental Investigation of Coarse Aggregates Used for Concrete Production in the Construction of Higher Educational Institution (HEI) Buildings

B F Ogunbayo and C O Aigbavboa

In the construction industry, an aggregate is an important material used in the production of concrete. The strength of any building component, constructed using concrete will depend on the type and texture of aggregates used. It is on this base that this study analysed two different types of coarse aggregate (crushed granite and washed gravel) used in the production of concrete for higher educational institution (HEI) buildings. The following experimental procedures such as silt content, water absorption, specific gravity, sieve analysis, were conducted on the aggregates sampled to determine the property quality of the aggregates when used with other adhesive. Concrete of ratio 1:2:4 were produced using crushed granite and the washed gravel sampled and its strength was tested with the compressive strength testing machine. The 28 days average compressive test of concrete produced with crushed granite and washed gravel are 23.36 N/mm^2 and 20.44N/mm^2 respectively. The study suggests that locally sourced gravel should be washed before use to reduced silt content and impurities in the coarse aggregate. The study concludes that base on the compressive strength result of the study both crushed granite and washed gravel can be used for concrete work in construction work or project, but their selection for usage should be based on expected imposed load.

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OPEN ACCESS 032013

A Single Stroke Cylinder Rapid Compression Machine for Chemical Kinetic Study at Elevated Pressure and Temperatures

Oku Nyong, Celestine Ebieto, Robert Woolley and Simon Blakey

The fabrication of a rapid compression machine (RCM) is in its early phase of design. The machine is designed to enhance the study of ignition delay and validation of detailed kinetics models of fuels. The machine compresses fuel/air mixtures isentropically within 25 to 52 ms with a varying stroke. The combustion chamber design is not fixed and can be adjusted through the threaded shaft lock and within chamber slots. The originality of the facility is the inclusion of a pneumatic piston release mechanism (PPRM), which is pneumatically operated. The current test facility has been characterised by conducting a nonreactive and reactive experiment, the result showed that an obtainable compressed pressure of 21 bar and end gas temperature of approximately 1000 K was achievable within the present facility. The fidelity of the facility was performed with a non-reactive experiment, which experimental pressure profile was seen to follow each other closely showing that the data are highly repeatable within the test condition, the result was free from any form of rebound or disturbance, which would have adversely distort the result. The experiment data was simulated implementing the effective volume approach and was seen to perfectly match with the experiment at both stages of compression. The reactive experiment was demonstrated with heptane/air mixture at stoichiometric condition, $T_C = 625 \leq 689$ K. The results show that the experimental pressure traces overlay each other thus signifying a repeatable pressure trace and this demonstrates that the Shef-RCM is operable and ready at its first stage of design for studying the ignition delay time of liquid fuels operating within an engine like conditions and for validating chemical kinetics models.

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OPEN ACCESS 032014

Face-based Gender recognition Analysis for Nigerians Using CNN

C.O. Lawal, A. A. Akinrinmade and J. A. Badejo

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Estimating human gender from faces in images is an important area of research as many applications rely on it. Facial recognition is a branch of biometrics that uses the face which is a physical trait to uniquely identify individuals. Gender recognition using face analysis is also an important task in computer vision as it helps in visual surveillance, intelligent user interfaces, demographic studies etc. The fundamental of gender recognition and other similar classification problem is broken into four stages i.e. the image to be examined to the pre – processing of the image, feature extraction and lastly classification. Several approaches including the deep learning approach which is a representation of the learning procedure that discover multiple levels of representations using neural network has been explored for gender recognition. This work is essential in creating a face-based recognition for gender analysis for Nigerians. The face database consists of over 6000 images of Nigerians with different variations. The created database was used to analyze gender by pre-processing the images, extracting necessary features and classification using the Convolutional Neural Network (CNN). An overall recognition accuracy of 98.72% was achieved demonstrating the feasibility and research potential in such direction.

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OPEN ACCESS 032015

Big Data And Real Estate: A Review Of Literature

A. O. Oluwunmi, B. A. Role, O. M. Akinwale, O. P. Oladayo and T. O. Afolabi

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The concept of big data though relatively new has brought a lot of solutions to modern day challenges. Many authors, particularly in developed countries, have adopted the concept in tackling the numerous challenges unfolding in the real estate profession. However, most of the findings from these authors are on individual bases and as such, there is a need to reach a general consensus on the relevance of big data to the real estate profession. The review shows the impact of big data to include digitization of records, information on user preferences, sensor information on the urban environment and sensor information on movement. The paper concludes that the relevance of big data to the real estate profession cannot be over-emphasised.

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OPEN ACCESS 032016

Development and Characterization of Zeolite-A from Elefun Kaolin

E.O. Yusuf, V. E. Efeovbokhan and R. Babalola

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Zeolites are important industrial materials of unique chemical structure that are utilized in various industrial plants as adsorbent for gases, liquid, solids or even as catalysts. The use of synthetic chemicals as starting materials for commercial production of Zeolite-A is cost intensive. However,

low-cost raw materials such as clay minerals, coal ashes, natural zeolites, municipal solid wastes and industrial sludge have been widely used. In this study, the synthesis and characterization of Zeolite-A from natural raw Kaolin (Elefun) clay using hydrothermal treatment technique was investigated. The raw and beneficiated kaolin were experimentally studied and comparison was made based on material characterization and application. Metakaolinization was achieved by thermal activation of the beneficiated kaolin at 850 oC for 2 hours. Thereafter, Sodium Aluminosilicate gel was prepared with the molar ratio SiO_2/Al_2O_3 = 2.6, Na_2O/SiO_2 = 3.0, and H_2O/Na_2O = 40 by mixing calculated amounts of metakaolin with sodium hydroxide solution of analytical grade. The gelled samples were aged for 24 hours at ambient temperature and subsequently crystallized for 24 hours at 100 °C. The starting kaolin, beneficiated kaolin, calcined kaolin and final product were characterized using X-Ray Fluorescence (XRF) and results were corroborated by X-Ray Diffractometer (XRD) and Scanning Electronic Microscope (SEM). The results showed that Zeolite-A can be synthesized from Elefun kaolin by ageing at room temperature for 24 hours and crystallization at 100 ° C for 24 hours.

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OPEN ACCESS 032017

Soybean Oil Biodiesel Production using Renewable Catalyst Synthesized from Guinea Fowl Eggshells

O. O. Fagbiele, A. A. Ayoola, T. D. Oyekunle and O. E. Yusuf

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The need for a sustainable energy has given rise to the search for a renewable source of energy. This research study presents the production of soybean oil biodiesel using synthesized guinea fowl eggshell catalyst (renewable catalyst). The catalyst preparation involves calcination at 850 °C for 3 hours in a muffle furnace. It was characterized using X-Ray Flourescence (XRF) and Scanning Electron Microscopy (SEM). Biodiesel was produced using 3-8 wt % of calcined catalyst within a time range of 1-2 hour, methanol/oil ratio of 0.25-0.5 w/w%. The highest biodiesel yield was 87.6% at optimum conditions of 8 wt%, 1.5 hours and 0.25 w/w% for catalyst amount, reaction time and methanol/oil ratio respectively. The biodiesel produced validates the successful synthesis of the guinea fowl eggshell into CaO. Biodiesel was then characterized to determine the acid value, flash point, cetane number, specific gravity, density, iodine value and kinematic viscosity. The characterization result of the biodiesel synthesized by using the guinea fowl eggshell catalyst produced showed that the biodiesel produced compares favorably with ASTMD standards.

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OPEN ACCESS 032018

Endogenous-Switching Regression Modeling of Farmers' Exposure to Climate Hazards and Reforestation in Selected Villages in Africa

T.O Oyekale and A.S Oyekale

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Deforestation remains a serious concern for Africa's economic development and global climatic stability. This paper analyzed the effect of exposure to climate-related hazards on tree planting among smallholder farmers in nine selected African countries. The data were from baseline surveys which were conducted by the CGIAR's research programme on Climate Change, Agriculture and Food

Security (CCAFS). The included countries were Burkina Faso, Ethiopia, Ghana, Kenya, Mali, Niger, Senegal, Tanzania and Uganda. Data were analyzed with Endogenous Switching regression considering the endogeneity potentials of climate-hazard exposure. The results showed that Uganda and Ethiopia had the highest average numbers of tree planting with 1.082 and 1.000 respectively, while Senegal (89.86%), Kenya (87.77%), Burkina Faso (82.86%) and Ethiopia (82.86%) had the highest exposure to climate-related hazards. Endogenous Switching regression results showed that climate hazard exposure was truly endogenous going by statistical significance of the Wald Chi Square test ($p<0.05$) and it was significantly influenced by female household headship, perception of more droughts, floods and low ground water. The number of tree that were planted increased significantly ($p<0.05$) with climate hazard exposure, degraded land areas, asset indices and residence in East Africa, while it reduced with female household headship. In addition, Average Treatment Effect (ATE) result indicated that an average household will plant 0.745 trees more when it had been previously exposed to climate shocks while Average Treatment Effect on the Treated (ATET) revealed that an average household that was exposed to climate hazards would plant 0.54 more trees than it would if it had not been exposed to hazards. It was concluded that many farmers had been affected by climate-related shocks and efforts to safeguard future climate through tree planting should be gender sensitive and concentrated among previously affected farmers.

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OPEN ACCESS 032019

Interference Mitigation Among Indoor Phone Subscribers In Lte Based Heterogeneous Networks Using Fast Response Frequency Reuse Technique

Osagie Ibhadode, A. Adekunle, C. O. Nwafor and I. I. Umanah

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Mobile phone users both for voice and data have increased tremendously in the last decade thereby making it necessary for service providers in the telecommunication industry maintain quality of service as much as possible. The huge complaint from indoor mobile users concerning signal coverage and capacity has made it a necessity to conduct this research. The aim of this research is to minimize interference among indoor phone subscribers in long term evolution (LTE) based heterogeneous networks using fast frequency reuse technique. Femtocells are deployed in varying number within the macrocell coverage area. For communication between femto and macro users within the network, a fast frequency response technique was proposed and parameters such as path loss, SINR and channel capacities were determined to ascertain the level of performance of the system when compared with a situation with random and unplanned deployment. Results show that a high SINR results when the bit error rate is low, this consequently improves communication and throughput in the network. The high values of throughputs for edge macro-femto users compared to inner edge-macro users are due to distance of macro and femto users from the macrocell. As femtocells increase for edge macro-femto users within the coverage area, throughputs reduced gradually

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OPEN ACCESS 032020

An Investigation Of The Influence Of Femtocells Network On A Small Size Indoor Environment Using Itu-R And Winner Ii Path Loss Models

Osagie Ibhadode, A. Adekunle, Joseph Azeta and Y. K. Abimiku

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The rapid integrations of wireless controls in mechatronics, the broadening applications of wireless radio communications in aviation, and the exponential increase in the growth of mobile phone users in the last decade have made it necessary to expand the capacity of GSM users and ultimately increase the system performance. It has also become imperative for service providers to ensure adequate coverage is provided for all mobile users in areas with poor or no service. Even though many solutions such as distributed antenna system, relays, macrocells, and picocells were developed but they could not proffer the needed solution to indoor users. In this perspective, researchers were of the opinion that femtocells have a gifted technology to enhance indoor coverage because of properties such as short power, short coverage area, reduced distance between device and user and being a plug and play device. It was however discovered that research findings on large deployment of femtocells does not corroborate when a handful is deployed. This study therefore examines the influence of femtocells network on a small size indoor environment using ITU-R and WINNER II path loss models. To accomplish this, femtocells were modeled in six apartments of a building and parameters such as path loss, received power and signal to interference plus noise ratio were determined to ascertain the performance of a particular femtocell under the influence of co-tier interference. Results show that the ITU-R model was found to experience lower path losses which produced higher received powers than WINNER II (-57.0445dBm on the average).

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OPEN ACCESS 032021

Simulation Experiments for Faults Location in Smart Distribution Networks using IEEE 13 Node Test Feeder and Artificial Neural Network

Adeniyi Kehinde Onaolapo, Kayode Timothy Akindeji and Emmanuel Adetiba

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The security and reliability of supply is often affected due to fault occurrence in electrical power Distribution Networks (DN). In the conventional DN, faults location takes more than the expected time, which results in economic losses to power utility companies as well as consumers. However, the advent of Intelligent Electronic Devices (IEDs) and recent advances in Information and Communication Technology (ICT) has made DN better, safer and smarter. In this paper, we present the outcome of simulation experiments carried out to locate faults in a DN. The IEEE 13 Node Test Feeder was simulated in SIMULINK with different fault conditions and the fault data acquired were utilized to develop an ANN classification model. The outcome of the experiments shows that the ANN based classification model is effective in locating faults on distribution lines with satisfactory performances.

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OPEN ACCESS 032022

Effect of Welding Current on Mechanical Properties and Microstructure of TIG Welding of Type-304 Austenite Stainless Steel

E. O. Ogundimu, E. T. Akinlabi and M. F. Erinosho

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The aim of this paper is to study the effect of welding current on the microstructure and the mechanical properties. Material characterizations were conducted on a 6 mm thick plates of type-304 austenite stainless steel, welded by TIG welding process at two different welding currents of 150 A (Sample F3) and 170 A (Sample F4). The tensile strength and the elongation obtained from sample F4 weld were approximately 584 MPa and 19.3 %; which were higher than sample F3 weld. The average micro hardness value of sample F4 weld was found to be 235.7 HV, while that of sample F3 weld was 233.4 HV respectively. Homogenous distribution of iron (Fe), chromium (Cr) and nickel (Ni) were observed at the welded joint of the two samples. The EDS analysis revealed that Fe, Cr, and Ni made up the composition formed at the weld zone. The optimum welding current of 170 A for TIG welding of type-304 austenite stainless steel can be recommended for high-tech industrial applications.

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OPEN ACCESS 032023

Optimization And Performance Evaluation Of Blender-Hammer Mill

C.O Ajayi, F.A Oyawale and S. A. Afolalu

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The principle of design by analysis was adopted for the design of this project. The methodology used was to scrutinize the common critical defects of conventional hammer mills and proffer possible solutions. The foremost components of the new blender-hammer mill were enumerated. The initial tests carried out on the new blender- hammer mill revealed that the mill is capable of performing same function that industrial huge hammer mills and the conventional hammer mills can perform in production of course, medium and fine particles.The results obtained after testing, showed that the crushing efficiency was between 83% to 96%, for dry maize and wheat respectively, which is quite satisfactory. Production of fine grains was achieved but coarse, medium and fine particles were still produced for further re-run for finer particle.

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OPEN ACCESS 032024

Development Of Blender-Hammer Mill For Multipurpose Use

C.O Ajayi, F.A Oyawale and S. A. Afolalu

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Few problems that have been identified with most of the existing developed blending and hammering machines/mills was strengthening on to achieved better performance. The aim of this project is to develop a blender-hammer crushing machine suitable for domestic and laboratory use for production of fine paste and coarse aggregates. The design was based on elimination of metal to metal contact, contamination of grinded material and excessive vibration. The blender-hammer mill consists of the following components; inlet hopper, grinding chamber, a combined crushing hammer blades vertically set and blending blade that are horizontally fixed. The mill was constructed from locally sourced martensitic stainless steel 420 series. A sieve was introduced beneath the hammer chamber to sieve the ground mass. The main shaft was mounted on two sealed ball bearings, and it rotates at speed of 2880 rpm transmitted by two 'B'V belt driven from a 3.75-kilowatt electric motor. The

results showed that better efficiency for both dry corn and cassava. We conclude that a blender hammer machine developed is capable of grinding grains legumes, dry cassava, and yams into fine and coarse aggregates.

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OPEN ACCESS 032025

Optimizing Design Patterns for Multi-Head Fused Deposition Modeling (FDM) Systems

B.E Ayodele, A.A Okesola, A.A Oyedeji, F.T Folaranmi, J Olowo and A.F Abdulhamid

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This research examined various factors that affect successful FDM-type 3D printing. Specifically diameters of the nozzles, extrusion width, and layer thickness were varied to create several print patterns and fills. These print patterns were tested for appearance/surface finish, strength, speed and stiffness of composite materials and then the best print parameters and methodologies were recorded. The solid interior pattern fill showed the highest volume fill available, representing fewer voids and thus better strengths and more durable parts. The solid interior pattern fill also had the best surface finish for all types of fill. Also, printing with small layer thickness produced stronger prints albeit at higher build times.

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OPEN ACCESS 032026

Property Upgrades of Some Raw Nigerian Biomass through Torrefaction Pre-Treatment- A Review

O.A. Akogun and M. A. Waheed

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Today, agricultural waste is one of the most common resources in Nigeria that could solve environmental, fuel and energy issues. However, it has some limitations such as low bulk densities, loose and irregular sizes, handling and storage problems, low energy density, reduced fixed carbon, low calorific value, high volatile matter and high moisture content etc. making it difficult to be utilized for fuel. One of the viable and promising technologies to upgrade the properties of raw biomass is through torrefaction technique which is capable of upgrading the combustion and fuel characteristics of biomass, demonstrated from behaviours that are similar to coal during combustion. During this process, about 70% of the initial biomass weight and about 90% of the original biomass energy is obtained as torrefied biomass while the remaining 30% biomass weight and 10% biomass energy is given off. In addition, the presence of moisture content in raw biomass that could aid biological degradation is reduced (< 3% w.b.) while combustion efficiency is being enhanced through upgraded fixed carbon and calorific value (15-25% wt) and reduced volatiles. These upgraded properties makes torrefied Nigerian biomass suitable to be used independently or co-fired in power plants and as an upgraded feedstock for domestic and industrial applications in a developing country like Nigeria. Unfortunately, there is scarce research materials on biomass torrefaction in Nigeria which could be attributed to the cost of acquiring torrefaction plant and other resources for torrefaction characterization which are on the high side. This paper therefore explores and reviews the property upgrades of raw biomass through torrefaction technique. The challenges of biomass energy in Nigeria, torrefaction effects on some Nigerian biomass, equipment used for the analysis of

torrefied samples, alongside the torrefaction properties, combustibility indices and their products were examined. The review study concluded that torrefaction technology is a promising technique in Nigeria which is capable of improving and upgrading the quality, energy value and other properties of raw Nigerian biomass and could at the same time serve as an alternative source of energy asides hydropower energy if embraced by the concerned bodies.

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OPEN ACCESS 032027

Modified VG-CL Detection System for Baseline Assessment of Dimethylsulphide and Dimethylsulphoniopropionate in Tropical Atlantic Seawater

E. A. Adedapo, N. U. Benson, A. B. Williams and K. Toda

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Several studies have been carried out to measure the concentrations of dimethylsulphide (DMS) and dimethylsulphoniopropionate (DMSP) in coastal and open marine ecosystems. The present study attempted the fabrication of a cost-effective, highly sensitive and portable detection system based on vapour generation and chemiluminescence for a pilot assessment and determination of DMS and DMSP concentrations in tropical Atlantic seawater samples. The Sultan Beach and Badagry parts of the Atlantic Ocean were chosen as designated locations for this study. Vapour generation chemiluminescence (VG-CL) detection system is a device that can measure the concentration (nM) of DMS and DMSP by allowing DMS vapour which in turn reacts with ozone to produce chemiluminescence which can be detected by a photomultiplier (PMT). The mean concentrations of DMS and DMSP in the surface seawater at the sampling location were 5.80±0.71 to 19.40±0.57 nM and 11.00±0.42 to 34.70±1.13 nM, respectively. The average minimum and maximum concentrations of DMS and DMSP across the location were between 0 and 40.91 nM, respectively. This study serves as a baseline measurement of DMS concentrations in the tropical Atlantic Ocean (Lagos).

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OPEN ACCESS 032028

Production of Clay Filters for Waste Water Treatment

V.E. Efeovbokhan, O.O. Olurotimi, E.O. Yusuf, O.G. Abatan and E.E. Alagbe

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Water borne diseases have continued to linger and has remained a major challenge facing most developing nations today. This has been caused mainly by lack of access to clean water. The rapid industrialization has led to the discharge of effluents loaded with pollutants into our water bodies that have greatly affected humans, aquatic life and the environment. This work looks into the possibility of improving the quality water through the elimination of (i) inherent contaminants in water using filters made from cheap locally available red clay and biomass (300 microns sawdust) materials and (ii) chemical treatment of industrial and domestic effluents which in itself is a source of environmental pollution. The sawdust-clay materials were first thoroughly dry mixed in four different weight ratios, 6/80 (sample A), 5/80 (sample B) 4/80 (sample C) and 2/80 (sample D) before water was then added gradually and mixed until the clay clumped together completely, softened and workable. It was then wedged by pressing firmly in order to remove bubbles from the inside of the clay and molded into cup--like shape. It was first sun dried then oven dried at 110 °C and then fired

in a Muffle furnace at 850 °C to burnout the sawdust biomass and thus create fine pores within the clay matrix. Performance of the sawdust-clay filters for the purification of waste water obtained from two different sources, industrial and kitchen effluents, was investigated. Results obtained from the study showed that the four filters (A, B, C and D) proved to be moderately effective for the treatment of the two effluents. All the filters reduced the total dissolved solids (TDS) to 120 and 110 mg/L of the industrial and kitchen waste water respectively, to acceptable levels which is less than 500mg/L, set by the World Health Organization (WHO). Conductivity values obtained after the treatment of the water samples were lower than the 1000 μs/cm limit set by WHO. And with the exception of filter D, others greatly reduced the turbidity of water samples as values less than 5 NTU as set by WHO were obtained. The pH values or acidity reduced for the industrial waste water from 4.5 to 7.02 and for kitchen waste water from 5.1 to 7.02 which met the specification set by WHO. Some of the heavy metals detected in the water samples were effectively reduced to acceptable levels. The filtration rates were 140, 100, 50 and 20 ml/min for filters B, A, C and D respectively. The rates rapidly reduced to about 2.7, 1.7, 1.0 and 0.7 ml/min for A, B, C and D respectively after 30 minutes of filtration. This implies that the filters were effective and should thus be developed for industrial and domestic waste water treatment applications.

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OPEN ACCESS 032029

Design Modification of a Cassava Attrition Peeling Machine

O. D Alli and M.S Abolarin

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There is still an increase in the demand for engineering innovations in designing cassava peeling attrition machines which will limit drudgery which its operators are being subject to. However, one major factor that has limited all existing designs is the fact that cassava tubers have irregular geometries. Hence, the emphases of this thesis is to design based on modifications, fabricate test and performance evaluation of a cassava tuber peeling machine using standard available materials by basically inculcating two contra-rotating shafts with brushes as deflectable knife edges and an auger that is inclined at an angle thus being powered by an electric motor and gravitational energy of the earth. The components of this machine include a main frame, feeding hopper, cylindrical peeling chamber, auger conveyor, belt and pulley transmission system, chain and sprocket transmission system, waste outlet, manual handle bearings and 1hp electric motor. By operation, cassava tubers are introduced into the feeding hopper which is then collected by the auger into the extracting compartment at an angle of 10 degrees, the auger conveyor which is well fitted inside the peeling chamber then translates the cassava tubers, and then presses the cassava tubers against the brushes. Each brush acts as a knife edge and also deflects to create an opening to accommodate the variable irregular cross sections along the length of any cassava tuber. The minimum and maximum mass of cassava tubers that are loaded into the peeling chamber from the introductory sector in different time intervals are 4.5kg and 5.0kg respectively. The Throughput Capacity of the machine is 47.9kg/h. The minimum and maximum force exerted per unit length of cassava tuber by each brush is 1.02Nmm-1 and 1.85Nmm-1 respectively. The machine was evaluated at stepwise speed of 50rpm from 50rpm to 250rpm. The minimum moisture content of each cassava tuber was 45% and a maximum of 70%. The maximum peeling efficiency was obtained at the minimum speed of 50rpm and a maximum moisture content of 70%.

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OPEN ACCESS 032030

Investigation into Steam Boiler Rupture: A Case Study of Egbin Electrical Power Business Unit (EEPBU), Lagos State

S. A Anjorin, O. Z Ayodeji and I. F Titiladunayo

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The study was conducted to investigate the causes, effects and controls of Boiler rupture in Egbin Steam. Thermal power plant, Lagos State. Three classes of boiler rupture were investigated for twenty-nine cases of boiler rupture. The cases were grouped into classes through stratified sampling technique. Analysis of Variance (ANOVA) at 95% level of significance was used to test the two research questions set for the study. The results of the study indicate that the various classes of boiler rupture are not equally significant, one class more prevalent and responsible for incessant forced power outages than the others. With respect to tube failure, the findings indicate that each of the various factors responsible is uniformly significant. Recommendations for proper maintenance planning, in order to prevent boiler rupture which could lead to forced power outage, were made. The effects of boiler rupture include reduction in load factor, plant utilization factor, profit, plant generation factor, plant efficiency and increase in down time, operation and maintenance costs.

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OPEN ACCESS 032031

Advancing PoC Devices for Early Disease Detection using Graphene-based Sensors

Oluwadamilola Oshin, Dmitry Kireev, Deji Akinwande, Emmanuel Adetiba, Francis Idachaba and Aderemi Atayero

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Early detection of diseases is key to better disease management and higher survival rates. It aims at discovering conditions that have already produced biochemical changes in body fluids, but have not yet reached a stage of apparent physical symptoms or medical emergency. Therefore, early disease detection relies majorly on biochemical testing of biological fluids such as serum, in the body. The laboratories for these tests require biochemical-based instrumentations that are bulky and not commonly available especially in developing countries. Moreover, the tests are expensive and require trained personnel to conduct and interpret results. On the other hand, Lab-on-a-Chip (LOC) biosensors have a potential to miniaturize the entire biochemical/laboratory methods of diagnostics into versatile, inexpensive and portable devices with great potential for low-cost Point-of-Care (POC) applications. They are capable of providing accurate and precise information on the measured health indices for sub-clinical level of diseases. Nanotechnology-inspired biosensors have further advantages of low limit of detection (required for early diagnosis), real-time analysis and lesser sample volume requirement. Of all other nanomaterials, graphene is said to be the most promising, suitable for biosensing due to its biocompatibility and consistent signal amplification even under the conditions of harsh ionic solutions found in the human body. This paper reviews the potentials, fundamental concepts and related works in using Graphene-based Field Effect Transistors (GFETs) as biosensors for early disease diagnosis. This paper also highlights a low-cost patterning mechanism for preparing SiO2/Si substrate for metal deposition (of the source and drain electrodes of FETs).

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OPEN ACCESS 032032

Agro Waste A Sustainable Source For Steel Reinforcement-Review

Sunday A. Afolalu, Segun Oladipupo, M Edun Bose, Abiodun A. Abioye, Samuel B. Adejuyigbe, Oluseyi O. Ajayi and Samson O. Ongbali

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In this review paper the use of agro waste as a sustainable source for steel reinforcing steel was investigated. Agro waste is said to have certain amount of carbon which can be useful for steel reinforcement, as stated by different authors the carbon derived from agro waste is said to be of high quality. From literature it was observed that there is an increase in demand of agricultural produce which mean automatic increase in agricultural waste and this threat on humans, plants and the environment, this alone shows that agro waste is sustainable as it is currently been underutilized in the steel or iron making industry. In this review different agro waste such as macadamia nut shell, potato peel, husk from cereal, rice husk etc, and it was observed that macadamia nut shell has the highest carbon content which is about 92%. Agro waste is a sustainable source of obtaining carbon and should considered by steel producing companies as the carbon content is high and its environmentally friendly.

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OPEN ACCESS 032033

Overview Impact Of Application Of Queuing Theory Model On Productivity Performance In A Banking Sector

Sunday A. Afolalu, Kunle O. Babaremu, Samson O. Ongbali, Abiodun A. Abioye, Ademola Abdulkareem and Samuel B. Adejuyigbe

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Banking sectors have perpetual queues owing to the significance of the services they render to humanity and this poses a merging challenge of queue management in the execution their jobs and in the effective delivery of services to their customers. The study focuses on the role of queuing theory in the banking sectors thus far from pedigree of queuing theory till date. This study used the historical approach to juxtapose the likelihood of the impact of queuing in the various activities in the banking as seen in the regular applications to established areas of telecommunications systems and engineering. The outcome of this review espouses that a few approaches have been applied to sort the problems encountered in the banking sectors for needful improvement. Some of these approaches are ANN (Artificial Neural Network), BPR (Business Process Reengineering) M/M/1, M/G/1 and the Erlang B&C formulas for the management of excessive bank reserves and customer queues in terms of waiting times and economic cost. These approaches have been able to improve the performance of the banking sector to an extent, however there is still a couple of limitation regarded as external factors that varies from one banking system to another and lots of works are needed to further combat the problems faced by the banking sectors.

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OPEN ACCESS 032034

Quenching A Significant Index Control In Heat Treatment – An Overview

Sunday A. Afolalu, Segun Oladipupo, Samson O. Ongbali, Abiodun A. Abioye, Oluseyi O. Ajayi, Ademola Abdulkareem and R Oloyede Olamilekan

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The use of metals in this present age has increased greatly, the metals that were used in the past in different industries such as the automobile or construction industry were metals that are heavy and expensive but there's been a rapid shift from that to lightweight metals that are less expensive and also have super strength due to the increased material properties such as ductility, hardness, wear resistance etc. Increasing the properties of metal is achievable by subjecting it to heat treatment, which helps in obtaining desirable properties. Quenching is known to be rapid cooling process for heated metals and it has significant effects on mechanical property, phase crystals location and structural analysis. This overview revealed the significant index control in heat treatment of a metal.

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OPEN ACCESS 032035

Preparation and characterization of activated carbon from plantain peel and coconut shell using biological activators

V.E. Efeovbokhan, E.E Alagbe, B. Odika, R. Babalola, T.E. Oladimeji, O.G. Abatan and E.O. Yusuf

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A concern over the toxicity of chemicals used during the activation stage in the preparation of activated carbon is beginning to gain attention. The study therefore looked into the possibility of using bio-activators (lemon juice and potash leached from the peel of unripe plantain) as activating chemicals, for environmentally friendly activated carbon. Coconut shell and the peel from unripe plantain were used as feedstock and pyrolyzed at 400 and 450 °c. An impregnation ratio of 0.25:1 was used while laboratory grade potassium hydroxide was used as a base activating agent as a control setup. Characterization of the activated carbon was carried out using parameters like bulk density and yield which were obtained using standard procedures. Results showed that activating carbon using bio-activators as activating agents had very good characteristics when compared with the control. Bio-activators are therefore recommended for the production of bio based activated carbon especially in the fields of medicine, food and pharmaceuticals. The effect of carbonization temperature on adsorption efficiency and pore structure were investigated using methylene blue as adsorbate and SEM respectively

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OPEN ACCESS 032036

Oxidation of Glycerol with Oxygen Molecules as the Oxidant over Activated Clay Material Catalysts

L. S. Ochonogor, V. E. Efeovbokhan, J. Sankar and E. E. Kalu

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Interest in glycerol oxidation to more useful products has risen significantly over the years. This has led to the development of several catalysts some of which are scarce, uneconomical and environmentally unfriendly. In this research, two catalysts prepared from red earth - 'A1' (calcined at 500°c) and 'A2' (calcined at 500°c and dealuminated) were characterized using x-ray fluorescence

(XRF) and used to oxidize glycerol with O2 molecules for 240 mins. The XRF results showed that Al_2O_3 (31.3%), SiO_2 (47.9%) and Fe_2O_3 (16.05%) were the predominant components in 'A1' while 'A2' showed a marked significant difference in Al_2O_3 (19.4%), SiO_2 (72.1 %) and Fe_2O_3 (0 %). The selectivities of the oxidation products with A1 were 18.8 % glyceric acid (GLA), 13.1 % lactic acid (LCA), 1.66 % oxalic acid (OXA) and 1.24 % formic acid (FMA), while for A2 they were (20.4%) GLA and (17%) LCA. 88.1% glycerol was converted but selectivity towards any of the products was low.

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OPEN ACCESS 032037

Study of Energy Efficient Building Design Techniques: Covenant University Health Centre

Anthony Nkem Ede, Douglas Kesi-Ayeba Kendyson, Solomon Olakunle Oyebisi and John Oluwafemi

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Energy efficiency, which is a key factor of sustainable building design is very beneficial to building occupants. This has made the focus on sustainability in the design, to be highly desirable. Studies show that two third of the energy used in existing residential buildings in Nigeria is generated via electricity, however; due to epileptic power supply, high cost of energy and high carbon emission, there is a need to minimize energy demand in the facility. This research evaluated sustainable design strategies and their effects on energy efficiency in warm humid climate of Nigeria. The climate, building envelope, heating, ventilation and air conditioning and lighting systems constitute are the main factors responsible for energy intake of a building. The research was based on case study of Covenant University Health Centre and data was collected through visual survey. The case study revealed that the building, at the time of construction did not consider sustainable design strategies in terms of materials of the building envelope, wall and window shading as well as natural means of cooling. Only lighting was considered.

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OPEN ACCESS 032038

Benefits and Drivers of Implementing Green Building Projects in South Africa

O A Oguntona, O I Akinradewo, D L Ramorwalo, C O Aigbavboa and W D Thwala

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Several negative environmental issues are attributed to the activities of the construction industry (CI) globally with South Africa as no exception. Hence, the introduction of sustainability concepts in other to address these challenges which continually threaten the health and existence of both the human and natural environment. Green building (GB) as a sustainable concept aims to address the social and economic concerns and not only the environmental issues in the built environment. The paper, therefore, evaluates the beneficial factors and ways of promoting the implementation of GB projects in South Africa. The study employs a structured questionnaire survey as an instrument for data collection. The study gathered data from construction professionals (architects, civil engineers, quantity surveyors, project managers, construction managers, and construction project managers) who are sustainability proponents. A quantitative approach to data analysis was utilised using percentage, standard deviation, and mean item score. From the data analysed, the results revealed improved indoor air quality, ecosystem protection, increased energy efficiency, enhanced health and

well-being of occupants, and minimised CO_2 emissions as the top five benefits of GB projects implementation. Availability of more financing options, improved market for green products/materials, education and training on GB technologies, provision of economic incentives, and affordability of GB materials are identified as the top drivers of GB projects implementation. The findings from this study will help create awareness and encourage the adoption and implementation of GB projects which in turn has the potential to combat the severe environmental challenges caused by the activities of the CI.

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OPEN ACCESS 032039

Gender and Academic Performance in Engineering: An Empirical Study in a Leading Nigerian University

A. A Abioye, F. A Ishola, O. P Abioye, O. A Odunlami, T. A Alayande and C. A Bolu

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Engineering is increasingly becoming a more popular career for women globally. This study aims at examining the performances of female students in comparison to their male counterparts. This is then used to determine if there is any correlation in their performances. The sample population for this research is the engineering students in Covenant University, a leading University in Nigeria. The performance of the graduating students in this school over 11 years, from 2006 to 2017, was analysed and studied. The research suggests that more percentage of female students now graduate with first class and the percentage of female students graduating with third class between these periods has reduced to almost nothing over years. Thus, it is recommended that more women should be encouraged to enrol in engineering courses, as they tend to thrive in courses such as Electrical and Electronics Engineering and Mechanical Engineering.

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OPEN ACCESS 032040

Overview for Improving Steam Turbine Power Generation Efficiency

Abolaji Joseph Omosanya, Esther Titilayo Akinlabi and Joshua Olusegun Okeniyi

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Electricity is an integral part of every society for which demand is growing continuously, whereas the production is still based on limited sources of energy derived mainly from steam and gas turbines, the turbomachinery. This paper presents an overview for preliminary study on the optimization of the design of the steam turbine. This was done with a special focus on the last stage low pressure turbine blades, for the reason that the design parameters of this component exhibit influence on the efficiency of power generation from the steam turbine electric power generating system. For supporting the study, a practical overview of the Egbin thermal power station, Nigeria, was included in the study with the parameters from the last stage low pressure turbine blade for this energy generation installation. By these, suggestions that could be undertaken for improving efficiency of the steam power plant for enhancing sustainability of electric power generation were also detailed in the paper.

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OPEN ACCESS 032041

Design and analysis of a solar powered phototherapy device

Abioye Mayowa and E Abioye Abiodun

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This study was carried out to design and construct a cost-effective and efficient solar-powered phototherapy device which can be implemented in areas where there are inadequate electricity and rural environment. Neonatal jaundice is the yellowish condition due to high-level bilirubin in a new born baby. This condition must be treated if the bilirubin level above 12 mg/dL. One of the common treatments is by using red and blue light phototherapy to convert bilirubin become more soluble in the water then easily excreted from the body. A microcontroller was used to regulate the radiation of light in the device and make it safe for the treatment of jaundice in a new baby. The device is powered by solar energy generated from the 24-volt monocrystalline solar panel, for charging deep cycle batteries via a charge controller. The wavelength of light is 460-490 nm with a minimum intensity of 30 μW/cm2. In this study, the phototherapy device is designed and tested. The red and blue light source consisted of thirty-six (36) high power Light emitting diode LED. Heat sink and fan are employed for the LED package cooling system. Solar power meter and spectrometer are used to analyze the intensity and wavelength produced by the LED.

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OPEN ACCESS 032042

Weight determination of glazing properties for Trombe wall application in Johannesburg: An entropy method implementation

C.K. Oluah, E. T. Akinlabi and H. O. Njoku

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Glazing materials have been found to greatly influence the performance of trombe wall systems. this is due to its role in determining the quantity of thermal energy that reaches the massive wall. in this article, a multi-criteria decision-making analysis for proper glazing selection for trombe wall system was considered, the location of interest is johannesburg metropolis. four different glazing types and four criteria were considered using the entropy method for weight determination. the four criteria considered were the solar heat gain coefficient (shgc), the u-value, visible transmittance and cost respectively. the result showed that the u-value is of utmost importance vis-a-vis other performance criteria for the glazing material. decreasing order of weights assigned was as follows; 71.2% weight factor for the u-value, 16% weight factor to cost, 10.2% weight factor to shgc and 2.6% weight factor to the visible transmittance respectively.

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OPEN ACCESS 032043

A Generalized Model for Automation Cost Estimating Systems (ACES) for Sustainable Manufacturing

O.M. Ikumapayi, E. T. Akinlabi, P. Onu, S.A. Akinlabi and M.C Agarana

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Automation technology is a new area of technology that requires proper selection of variables to minimize cost and maximize profit. This paper is aim at developing a mathematical model that will be able to solve all automation cost estimating systems (ACES), be it full automation, partial automation, manufacturing automation or service automation as well as fixed, flexible or programmable automation. Extensive research has gone into cost modeling over the years and many commercial, as well as free software solutions, have been widely exploited to proffer solutions to cost modeling especially in ACES. Hence, a lasting solution to the problem of ACES, its implementation, and application in automated manufacturing and process industries is demonstrated in this paper.

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Influence Of Zirconium Diboride (ZrB_2) on the Physio-Mechanical Behavior of AA8011 Alloy base.

J. Fayomi, A.P.I. Popoola, O.M. Popoola and O.S.I. Fayomi

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The AA8011 reinforced with 5 to 20 weight percent of zirconium diboride (ZrB_2) were developed via stir casting route. In this current research work, characterization evaluation was conducted on the AA8011 alloy and its composites with the varying composition to investigate the physical and mechanical properties. The results of the mechanical properties obtained revealed an enhanced hardness and strengthening mechanism propagation of the composite in comparison to the base alloy AA8011. The experimental studies show that the addition of ceramic particles into the molten metal alloy resulted in improved properties. Also, an increase in the percentage composition of the particles leads to an increase in the strength value of the composite. Generally, the improvement in the hardening mechanical behavior of the composites can be attributed to the intrinsic properties of the incorporated particulates.

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OPEN ACCESS 032045

Selection of glazing material for Trombe wall applications in Johannesburg using the TOPSIS methodology

C.K. Oluah, E.T. Akinlabi and H.O. Njoku

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Glazing are functional components of Trombe walls, they determine to a great extent the performance of the system. selection of optimal glazing for trombe wall application was considered in this article and the TOPSIS methodology was employed. TOPSIS is a multi-criteria decision-making algorithm which means a technique for order preference by similarity to ideal solution. considered in this article were four different glazing types and four criteria. the single glazing was the closest to the ideal solution followed by the double pane glazing with low emissivity coating, double pane glazing with high emissivity coating and the triple pane glazing respectively

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OPEN ACCESS 032046

Corrosion Inhibitors as Building Evidence for Mild Steel: A Review

D.T. Oyekunle, O. Agboola and A.O. Ayeni

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Mild steel is the most common type of metal used in large industries due to its acceptable material properties and low cost. However, a growing concern of its use has been limited as a result of its low resistance to corrosion especially in acidic and alkaline environments. The use of corrosion inhibitors has been encouraged by various researchers as a means slow down the corrosion rate and thus reduce monetary losses to industrial vessels, surfaces and equipment. This paper presents the types of inhibitors employed by different researchers on various mediums. It also seek to consider the limitation processes caused by some factors such as temperature of the media and concentration of the inhibitors and the media. Although the use of green inhibitors has been greatly encouraged due to its low cost but the combination of it with other kinds of inhibitors can prove to boost its effectiveness in corrosion inhibition process. Other organic materials such as animal discharge, and biomaterial should also be considered in future research works. These will further provide more literature to corrosion inhibition of mild steel which in essence promotes the life span of the metal.

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OPEN ACCESS 032047

Assessment of the Performance of Osmotically Driven Polymeric Membrane Processes

O. Agboola, S. E. Sanni, D. T. Oyekunle, A. O. Ayeni, B. A. Oni, A. Ayoola, P. Popoola and R. Sadiku

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The universal water scarceness and the extensive ordeals with energy cost in conjunction with the undesirable ecological effects have advanced the improvement of novel osmotically driven membrane processes. Membrane processes which are osmotically driven are developing type of membrane separation procedures that apply concentrated brines to separate liquid streams. They are adaptable in various applications; hence, allow them to be an attractive substitute for drug release, wastewater treatment and the production and recovery of energy. Although, internal concentration polarization (ICP) occurs in membrane practises which are osmotically driven as a consequence of hindered diffusion of solute in a porous stratum, their interest has even increased. Here we review two natural membrane processes that are osmotically driven; Forward osmosis (FO) and Pressure retarded osmosis (PRO). Thus, the major points are as follows: 1) it was highlighted in this review, that the major developments in FO process, important for the process efficiency is to choose a suitable membrane and draw solution. 2) The recent evaluation, understanding and optimizing the activities of fouling throughout the osmotic dilution of seawater employing FO was discussed. 3) Recent advancements of FO in the application of food processing was reviewed. 4) It was highlighted that the main concept of PRO for power generation is the energy of mixing that offers great assessment of the non-expansion work which could be generated from mixing; nonetheless, the development of effective membranes with appropriate arrangement and performance is needed for the advancement of PRO process for power generation. 5) One major challenge of osmotically driven membrane processes, most recent developments and model development to predict their performances were discussed.

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OPEN ACCESS

Model assessment of a nanofiltration membrane for the removal metal ions from simulated wastewater

032048

O. Agboola, A. Kolesnikov, E.R. Sadiku, J.P. Maree, R. Mbaya and S.E. Sanni

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This paper accords the likelihood of applying Donnan and Steric Partitioning Pore Model (DSPM) together with extended Nernst-Planck model to elucidate the capacity of charge and Donnan exclusion mechanisms in removing ions from simulated wastewater in Nano-Pro-3012 membrane filtration process. The extended Nernst-Planck model reports the transportation of cations across Nano-Pro-3012 with respect to electrical potential gradient, movement of solutes and pressure difference through the membrane. The working principle of these two equations is dependent on the adsorption of the charged surface, diffusion and convective transport. This principle was established with a software called Comsol multi-physic 4.3b to explain the capacity of charge and Donnan exclusion mechanism of Nano-Pro-3012. The extended Nernst-Planck model and the Darcy law model were applied to evaluate the physical interrelationship amidst NanoPro-3012 and ionic solutions with the aim of having a good understanding of the transport and rejection working operation of the ions. The principle of these equations was first used to envisage the capability of Nano-Pro-3012. The data obtained were validated with the laboratory data. There was an establishment that movement of solutes across the membrane bring about diffusion transport. The total flux in solution increases due to the working operation of the diffusion which in turns reduces the electrical potential, as a result, reduces the flux in the membrane. Ions smaller than pore sizes are rejected and the theoretical data is in conformity with the experimental data.

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032049

Advancement in the application of alloys and composites in the manufacture of aircraft component: A review

F.M Kgoete, A.P.I Popoola and O. S. I. Fayomi

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Failures in aerospace structural components have catastrophic consequences, which results in loss of lives and of the aircraft. Failure occurs when a component or structure is no longer able to withstand the stresses imposed on it during operation. Application requirements of aerospace components involves high durability in order to withstand high temperature and pressure environments (such as leaving the earth's atmosphere or exposure to burning rocket fuel) and must be light weight for easy lifting and fuel efficiency for rockets. Compressor blades in aero-engines are designed for many distinct functions and are required to withstand high temperatures imposed on them by high rotational speed in the form of large centrifugal load and aerodynamic force applied as a function of pressure rise through each stage of the compressor. The paper reviews the advancement in the application of alloys and composites in the manufacture of aircraft component.

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032050

Persulphate-based degradation of total petroleum hydrocarbons in contaminated water

O. P. Bo lade, B. M. Durodola, A. B. Williams and N. U. Benson

The present study investigated the degradation of total petroleum hydrocarbons (TPH) in crude oil polluted water using sodium persulphate as a chemical oxidant. Laboratory-scale contaminations of water and degradation experiments using 0.1 M oxidant were carried out with contact time ranging from 1 to 15 days. The TPH extraction was carried out and analyzed using gas chromatography flame ionization detector (GC-FID) (Agilent 7890A). 72% of ETPH was degraded within 15 days from an initial concentration of ~137 mg/L. Results indicated 99% efficiency in TPH degradation achieved within the first 10 days after initial contamination. Remediation technique on laboratory- and field-scale is promising and could potentially address major oil pollution contamination issues.

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Walk-Through Energy Audit of An Institutional Building

O. E. Atiba, U. K. Efemwenkiekie, R. O. Olatunji, O. S. Ohunakin, D. S. Adelekan and O. A. Oyeleke

Improving energy efficiency requires detailed information on energy utilization. Many a times, institutional buildings across developing countries are not energy efficient. Thus, they require quantitative energy consumption audit information. This study outlines daily, weekly and annually projected energy consumption in an academic building within Nigeria. Measurements of the energy utilizations of the building were in accordance to ASHRAE Standard 22, ASHRAE/IES Standard 100-2015 and BCA Health Check report guidelines. Results showed that HVAC appliances and electrical motors driven gadgets consumed 36% and 61.9% of the total energy supplied. In conclusion, improving energy efficiency of similar facilities requires energy conservation practice in terms operating motors and other HVAC devices off idle-time and non-occupancy period respectively.

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Influence of Facilities on Patronage of the Various Shopping Malls in Ibadan, Nigeria

C. O. Iroham, O. M. Akinwale, A. O. Oluwunmi, H. I. Okagbue, O. D. Durodola, C. A. Ayedun, M. E. Emetere and J. N. Peter

The way shopping malls have sprawled every nook and cranny particularly in the developing economy is evident from major cities to even sub-urban areas. The expansion evident in the various locations of these shopping malls can be attributed to its patronage. Earlier researchers have linked the patronage of these malls to influences resulting from location, gender, image, type of shoppers amongst other. Even though studies on facilities and how it influences patronage are evident particularly in the developed economies such work also studied other factors thereby not giving a detailed finding on the linkage between facilities provided in such malls and the level of patronage from shoppers. This present study thereby focuses on influence of facilities provided on patronage of the five (5) identified shopping malls in Ibadan, Oyo State Nigeria. The study being a cross-sectional research survey entailed the distribution of questionnaires to 143, 126, 127, 145 and 126 shoppers of Cocoa Mall; Heritage Mall; Jericho Mall; Palms Mall and Ventura Mall, respectively all located in the study area, Ibadan. A cumulative response rate of 80.3% was attained. Data collected was analysed

using descriptive statistics of weighted mean and substantiated with factor analysis. It was revealed that most identified facilities in the malls have a great influence on patronage of the malls. However, in order to avoid superfluity of investment, investors could commence provision of Eatery / Food court (Co-V1, 0.72) as recreation facility; Kids play center (Co-V1, 0.79) as children's facility; Toilet/Restroom (Co-V1, 0.84) as service facility; POS (Co-V1, 0.91) as banking facility and free medical checkup (CoV1, 0.91) as health facility as these have most remarkable influence on patronage of the malls. The researchers hereby advocated that investors can be guided in the provision of the relevant facilities to prevent superfluity while the keen sustenance of these specific facilities can sustain patronage of the various malls in the study area.

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Reliability Assessment of the Nigerian Timber – An Environmental Sustainability Approach in the 21st Century

T.A Alayande, A.N Ede, J.I Aguwa, O.M Ofuyatan, S.O Oyebisi and J.O Oluwafemi

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An important component of environmental sustainability is how we can continue improving human welfare within the limits of the earth's natural resources. With recent research showing that carbondioxide levels in the air are at their highest in 650, 000 years and thus an alarming depletion of the ozone layer, the challenge currently facing many countries is how to respond to the issue of climate change. Steel, reinforced concrete and timber are the most commonly used structural materials worldwide. However, carbondioxide emissions from steel and cement production have been found to be the first and second largest sources of industrial CO_2 emissions worldwide and this has prompted the inclination towards timber as a structural material. Timber is decomposable or biodegradable as well as renewable and its production does not require the use of high energy fossil fuels as in the production of some other building materials such as steel or even brick. Nigeria is blessed with several timber species in different wood classes but despite the environmentally sustainable and obvious advantages of timber, it is being grossly underutilized as a structural material in Nigeria because there is limited information on the reliability of timber considering the wide property variability between and even within, timber species. This paper addresses the need for reliability analysis of various Nigerian timber species with a view to determining and establishing their structural strength to encourage the use of the Nigerian Timber as a structural material. The need to revise the Nigerian Code of Practice for the structural design of Timber is also emphasized in this paper.

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OPEN ACCESS 032054

Maximizing The Output Power Harvest Of A Pv Panel: A Critical Review

E. O. Ogundimu, E. T. Akinlabi and CA Mgbemene

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The quick exhausting of traditional energy sources and the present consistently expanding energy request with regards to ecological issues have supported concentrated research on solar energy innovation. Apprehending most extreme energy from the sun by utilizing solar PV technology is

impenetrable. A few features that influence the solar energy yield of this technology comprise the material of the photovoltaic, solar irradiances topographical area, the orientation of the panel, the angle of sun and surrounding climate. This present work reviews the ideologies and contrivances of solar PV tracking systems to decide the greatest solar panel tilt-angle, both isotopic and ant isotopic solar models and uses of numerous procedures for outlining solar panel tilt- angle by means of dissimilar optimization techniques. The work displays that sun-tracking systems are quite expensive than the opposing fixed mounted variety. This is mostly due to having motor-powered and moving portions. More also, having all these moving and mechanical parts means that there will be some amount of regular inspection, adjustments or even replacements required which leads way to another disadvantage. For greatest energy harvest, the optimum tilt angle for solar PV systems must be resolved definitely for every territory as it is basic for most extreme power generation by the system.

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OPEN ACCESS 032055

Efficacy of Corrosion phenomena, challenges and control in steel industry: An overview

A.B Anwo, K.O. Ajanaku, O.S.I Fayomi and A. Olanrewaju

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The mitigation of corrosion is a major problem for many industries all over the world as it is costly to maintain metals especially in all energy sectors. There are different methods been used such as painting, coating and galvanizing; but, all these solutions are relatively expensive and cause harmful effect to the environment. it is pertinent to develop and apply emerging technology that will yield high resistance to corrosion, as a way of controlling corrosion in order to reduce corrosion cost, lower the risk of failure, accidents and extend the useful lives of equipment and building. This foster the search of natural plants with green inhibitors which are eco-friendly and relatively inexpensive. This paper investigates the corrosion mechanism process and possible mitigation in steel application.

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Effects of Heat Treatment Techniques on the Fatigue Behaviour of Steel Gears: A Review

Enesi Y. Salawu, Oluseyi O. Ajayi, Anthony Inegbenebor, A.P.I Popoola and U.O. Uyor

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Heat treatment of gears are fundamental to efficient and reliable gear production because of its contribution to the overall cost of manufacturing. Different heat treatment techniques are targeted to improving hardness, ductility and strength to minimize material degradation or wear. However, several heat treatment methods had led to gear tooth distortion such as shrinkage of tooth thickness which eventually affects the contact angle. The study therefore focused on some selected heat treatment on gears and their effects on gear applications. from the reviewed heat treatment techniques, distortion is a common occurrence that result to gear fatigue. Also, it was noted that most times, the medium for quenching and most importantly, variation in the concentration affects the gear accuracy. Thus, local fracture and material loss ensue. Nevertheless, the study further suggested the use of empirical model and simulation approach for stress prediction.

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Phytochemical and Proximate Analysis of African Oil Bean (*Pentaclethra macrophylla* Benth) Seed

D.K. Akinlabu, T.F. Owoeye, F.E. Owolabi, O.Y. Audu, C.O. Ajanaku, F. Falope and O.O. Ajani

Medicinal plant research is a highly diversified topic of interest owing to applications of their phytoconstituents in drug discovery, human dietary intake, corrosion inhibition, material science research among others. The study revealed the phytochemical composition and proximate determination of *Pentaclethra macrophylla* benth (African oil bean) seed. The dried seeds of *Pentaclethra macrophylla* benth were pulverized into fine powder and a portion of it was extracted with n-hexane. The result of the phytochemical screening of the extract from *Pentaclethra macrophylla* showed that the oil seeds contained terpenoids, cardiac glycosides and saponin while steroids, alkaloids, flavonoids, tannins, phlabotannins and anthraquinones were not detected. Proximate analysis indicated low moisture content (1.895 %), while other parameter determined include ash (2.033%), crude fibre (17.227%), acid value (8.182), iodine value (101.235), peroxide value (20.06), and free fatty acid (4.091). This extract is a candidate with potential for further study regarding unveiling of their mechanical properties for technological advances.

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OPEN ACCESS 032058

Design and Construction of Air-Proof Metallic Digesters for Biogas Production from Varied Co-Digestion of Selected Agricultural Residue with Cattle Dung

M. A. Olojede, O. Ogunkunle and N. A. Ahmed

Biogas is produced from anaerobic digestion of biodegradable solid wastes in bio-digesters. Agricultural residues, comprising of animal manure and waste biomass, can constitute unfavourable environmental issues if not properly disposed. Studies aimed at converting these residues to energy need serious attention due to fast depleting rate of fossil fuel and its environmental hazard. Four cylindrical biogas digesters (A, B, C and D) of 0.052m^3 capacity each were constructed and fed with cattle dung, sunflower leaves, pawpaw and potato peels at different percentage composition. The experimental set-up was left for a retention period of 40 days, after which biogas production stopped. Results revealed that the percentage Organic Dry Matter (%ODM) of cattle dung, sunflower leaves, pawpaw and potato peels were 94.91, 95.92, 97.75 and 96.60 respectively. The total volume and methane contents of biogas produced from digester a, b, c and d were 46.64, 45.80, 39.55 and 38.02 m^3, and 71.82 %, 53.71 %, 66.80 % and 52.70 %, respectively. Analysis also revealed that digesters A had the highest Fresh Mass Biogas Yield (FMBY), Organic Dry Matter Biogas Yield (ODMBY), Fresh Mass Methane Yield (FMMY), and Organic Dry Matter Methane Yield (ODMMY). The Higher Heating Values (HHV) of biogas obtained from digesters A, B, C and D were 6.931, 5.680, 6.679 and 5.549 kcal/kg, respectively.

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OPEN ACCESS 032059

Numerical Analysis of Flow Induced Vibrations of a Low-Pressure Steam Turbine Rotating Blade

T. Molale, N. Ahmed and M. Bhamjee

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This paper presents the results of a numerical synthesis and characterization of vibrations of low-pressure steam turbine last stage rotating blades. A Fluid Structure Interaction (FSI) study is carried out using ANSYS Fluent 18.1 and ANSYS Mechanical 18.1. Using a one way coupling between ANSYS Fluent and ANSYS Mechanical, it was possible to link the two systems and allow pressure force calculations from Fluent to be used for the blade excitation in ANSYS Mechanical. The result of simulation shows that the blade exhibits vibrations which are characterized by amplitude modulation. An approximation for the equation of motion along the axial, radial and tangential direction was uncovered and fit. The three approximations for the blade vibration show a good agreement with results from ANSYS Mechanical. The effect of liquid mass (droplets) in the flow in the blade vibration was also investigated numerically. It is shown that increase in liquid mass is directly correlated with increase in the amplitude of the vibrations but has no effect on the frequency of the vibrations.

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OPEN ACCESS 032060

Biogas Yields Variance from Anaerobic Co-Digestion of Cow Dung with Jatropha Cake Under Mesophilic Temperatures

O. Ogunkunle, N. A. Ahmed and K. O. Olatunji

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Anaerobic co-digestion requires the digestion of two or more homogenous substrates to produce biogas. The superlative participated condition is when principal amount of most important substrate (example manure or sewage sludge) is combined and fermented with each other with lesser quantities of single, or a variety of additional substrate. The co-digestion of one or more substrates commonly improves the biogas output from anaerobic digesters owing to positive improvement brought about in the digestion medium and the furnishing of missing nutrients in one substrate by another. Anaerobic co-digestion of cow dung and jatropha cake for biogas production was carried out in the batch digester in the absence of oxygen at ambient temperature with different mixing ratios for 40 days. The result indicated that treatment with 75% jatropha 25% cow dung had the highest volume of biogas at the rate of 24.41% and treatment with 100% jatropha released has the highest percentage quality of biogas produced (methane) at the rate of 59.6%. Treatment with 50% cow dung 50% jatropha cake was found to be the appropriate mix ratio, since it was rank 2nd in both qualitative and quantitative analytical point of view from the experiment performed.

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OPEN ACCESS 032061

Application of Carbon-based Nanofluids in Heat Exchangers: Current Trends

Adeola O. Borode, Noor A. Ahmed and Peter A. Olubambi

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The thermal performance of a heat exchanger can be enhanced by adding carbon nanostructured materials such as carbon nanotubes and graphene to the conventional working fluid. When nanomaterials are suspended in the working fluid, the fluid is known as Nanofluid. The enhancement in the thermal and rheological properties of the fluid is responsible for the augmentation in heat transfer performance. The influence of carbon nanomaterial on the thermophysical properties, heat transfer characteristics and flow properties are reviewed. The current trends on the utilization of carbon-based nanofluids in heat exchangers were reported. The study shows that carbon-based nanofluids have the potential to improve the performance of heat exchanger and reduce the cost of fabrication by reducing heat exchange area. The study identifies the scope for future study.

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OPEN ACCESS 032062

Effect of Factory Process and Location on Residential Area Noise Level

A. P. Azodo, C. Onwubalili, T. C. Mezue, C. N. Nwaokocha, U. V. Akpan and S. O. Giwa

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Tranquility is one of the healthy environment factors on the residential areas which elevate the standard of living of the people and their psychological well-being. On the contrary, when there is a high level of noise intrusion at home, it might deprive one of these benefits. This study measured the industrial noise intrusion level in the residential area with respect to distance. A total of 40 residences, with 8 each around 5 food and drug processing factory sites in three local government areas (Idemili North, Onitsha North, and South) of Anambra state, Nigeria were selected as study site locations. Benetech Model GM 1352 digital sound level meter was used for the measurement of environmental outdoor noise levels at a height of 1.5 m and 3 m from any reflecting surfaces. The distance between the factory sites and the residences assessed was calculated using the coordinates of the study site points obtained with A Garmin GPS 72H on the CDXzipdistance2WP function on Microsoft Office Excel. All measurements were carried out during the daytime between 6:00 am – 10:00 pm. Three categories of environmental outdoor samples of noise levels were obtained; off work-hour, and work hour which comprises of generator usage and the national grid connection hours. The computed L_{Aeq} noise intensity level obtained at the residences assessed showed that 12(30.0) and 28(70.0) of the residences assessed were quiet and moderately loud during national grid connection hours which was; quiet 32(80) and moderately loud 8(20) during off work-hours. It, however, translated to moderately loud 24(60.0) and very loud 16(40.0) during the engagement of the services of electricity generator. The Pearson correlation analysis showed that there was a strong negative correlation between the distances of the residences assessed from the factory sites and the noise level which were significant at $p < 0.01$ for values of $r = -0.976$ during generator use and 0.981 when compared with the national grid. This implies that the closer factory sites are on the residential area the higher the noise intrusion level which is not healthy.

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OPEN ACCESS 032063

Emission Properties and Performance Characteristics of Jatropha Curcas L. and Spirulina Platensis Microalgae oil-based biodiesel in diesel Machines

B. A Oni, O. Fagbiele, O. Agboola and V. A. Olawepo

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The article aims at investigating the performance of diesel engine and emission properties of non-eatable oils methyl esters of J. Curcas L. and Spirulina Platensis microalgae based biodiesel in diesel engines (DE). Kirloskar Six cylinder diesel engine was the test engine used to ascertain the level of Break Power (BP) and BSFC and the Emissions of Carbon (IV) Oxide (CO2), Hydrocarbons (HC), Carbon monoxide (CO) and Nitrogen Dioxide (NOX). Different ratios of biodiesel were mixed with diesel fuels using 10.0 and 20.0 percent by volume of methyl esters with the diesel fuels for example AB10 (10% by vol. Biodiesel and 90% by vol. Diesel fuels), JB10, AB20 and JB20 respectively. However, the procedures of the experiment was in agreement with EN 14214 and ASTM D6751 procedures. The biodiesel fuel samples used decreases the brake power (BP) and increase brake-specific fuel consumption (BSFC) when compared to conventional oils. Results from emission indicates that the blended biodiesel reduces CO, CO2 and HC Emission and causes an increase in NOX emission. Since AB10 gives lesser emissions, it is a better option for diesel fuels in engines that are not modified to minimize exhaust releases in the environment.

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OPEN ACCESS 032064

Analyses of the Gravimetric and Electrochemical Effects of $C_{16}H_{13}N_3O_3$ on Mild Steel Corrosion in 0.5 M H_2SO_4

Francis O. Edoziuno, Benjamin U. Odoni, Adeolu A. Adediran, Joshua O. Okeniyi and Esther T. Akinlabi

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This study analyzed the gravimetric and electrochemical effects of $C_{16}H_{13}N_3O_3$ (methyl-5-benzoyl-2-benzimidazole carbamate: Mebendazole) on mild steel corrosion in 0.5 M H_2SO_4, for gaining insights on correlation and significance of differences between the two corrosion-monitoring techniques. For the gravimetric method, weight loss of mild steel specimens immersed in different $C_{16}H_{13}N_3O_3$ concentrations mixed in the 0.5 M H_2SO_4 were obtained for corrosion rates and inhibition efficiencies estimations. For the electrochemical approach, mild steel samples were subjected to potentiodynamic polarization experiments in the different $C_{16}H_{13}N_3O_3$ concentrations in 0.5 M H_2SO_4 that were employed for the gravimetric technique for obtaining instrumental readout of corrosion rate. Results showed that the corrosion rate from the electrochemical experiments exhibited excellent linear correlation (R = 99.91; Nash-Sutcliffe Efficiency = 99.83) with the dataset obtained from the gravimetric corrosion assessments. Both the gravimetric and electrochemical monitoring of mild steel corrosion gave inhibition efficiencies, $\eta > 90\%$, by the different $C_{16}H_{13}N_3O_3$ concentrations for the study. Also, homeoscedastic and heteroscedastic student's t-test statistics indicated that the differences between the corrosion inhibition efficiencies from the electrochemical and gravimetric techniques were not significant, p-value = 0.9729, but significant for their corrosion rates: $1.52 \times 10^{-6} > p\text{-value} > 8.15 \times 10^{-9}$.

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OPEN ACCESS 032065

Thermal Analysis of Solar Box Cooker in Omu-Aran Metropolis

A. O. Onokwai, U. C. Okonkwo, C. O. Osueke, T.M.A. Olayanju, C. A Ezugwu, R. S. Diarah, S. O. Banjo, E. Onokpite, T. S. Olabamiji, M. Ibiwoye, J. A. James and T. C. Nnodim

− Hide abstract PDF

Just like other solar cookers, the solar box cooker needs energy gotten from the sun to operate without producing emissions. In this research, a solar box is fabricated to reduce over-dependence on fossil fuel for energy generation. This reduces the environmental degradation caused by the use of other sources of energy. The ASHRAE empirical model was used to obtain the solar irradiance present in Omu-Aran metropolis. Thereafter, the no-load and load test was conducted to determine the cooker's thermal performance. The tests were conducted between January 2018 and January 2019 in Landmark University, Omu-Aran, Kwara State, Nigeria with geographical coordinates 8° 8' 0" North, 5° 6' 0" East. The average energy and exergy efficiency of the cooker were 32°C and 28°C respectively. A decrease in the efficiency of the cooker was observed. This was because the reflector, which is made from aluminium foil, was degrading. As a result of this degradation caused the sun rays (radiation) to be reflected poorly into the absorber and also caused a myth of overcast sky. Meanwhile, the variation in solar radiation during the sensible heating test resulted in the fluctuation inefficiency. The ratio of water to absorber temperature which was above 0.80 during the pre-boiling heating process indicates that the cooker can be recommended for sterilization.

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OPEN ACCESS 032066

Investigation of Influence of Coaxial Antenna Slot Positioning on Thermal Efficiency in Microwave Ablation using COMSOL

Olumide Towoju, Felix Ishola, Timilehin Sanni and Obafemi Olatunji

− Hide abstract PDF

Continued development of the minimum invasive interventional technology in recent years has proven ablation therapy to be a safe and effective local treatment for cancers and has become increasingly important in the medicine. This is the reason for its preference for treating larger tumors than for radiofrequency ablation. The authors studied the influence of the geometry of the antenna used on the efficiency of the procedure to obtain a thermal lesion at the site of the tumor. The influence of the position of the coaxial antenna on the extent of the thermal lesion at the site of the tumor was investigated numerically by varying the distance from the position of the end of the antenna with COMSOL Multiphysics as the modeling tool. The coaxial antenna investigated has a 1.79 mm diameter range with a center conductor of 0.29 mm diameter and Tefzel ETFE as the material of the catheter. The power of the coaxial antenna was optimized with a slot spacing of 6 mm from the tip of the antenna. The total power dissipation density, and thus the degree of thermal damage generated during the process was found to depend on the position of the slots of the coaxial antenna.

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OPEN ACCESS 032067

Manufacturing Sector Performance And Economic Growth In Nigeria

A. Afolabi and O. T. Laseinde

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The paper attempted to examine the impact of manufacturing sector output on economic growth in Nigeria from 1981 to 2016. The study employed secondary data sourced from the Central Bank of Nigeria statistical bulletin for Autoregressive Distributed Lag (ARDL) model and the Granger

causality techniques on RGDP, manufacturing capacity utilization (MCU), manufacturing output (LMO), government investment expenditure (GINVEXP), money supply (LM2) and interest rate (INR). Evidence of long-run and short-run relationships among the variables was established. The results showed that MCU has positive influence on RGDP while LMO also affects RGDP positively. It also showed that GINVEXP has negative effects on RGDP whereas LM2 influenced RGDP positively. Moreover, the result indicated a unidirectional causality between RGDP and MCU, LMO and LM2. Based on the above, the study suggest government should intensify efforts to promote socio-economic infrastructural, macroeconomic and institutional framework in Nigeria to provide favourable environment for external and domestic institutions interactions; so harnessed mobilized funds effectively towards productive manufacturing sector.

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OPEN ACCESS 032068

Phenomenological Model Development of Percentage Protein Present in Fermented African Locust Beans Seed

Modupe Elizabeth Ojewumi, Abiodun James Omoleye, Adesola Adetutu Ajayi, Daniel Temitayo Oyekunle and Ayodeji Ayodele Ayoola

− Hide abstract PDF

The optimum conditions for the fermentation of a local legume known as African locust bean (*Parkia biglobosa*) into a vegetable protein based food condiment or spice (Iru) were developed using Levenberg-Marquardt (or Powell) method (using PSI software) with three (3) variables namely; inoculum concentration (*bacillus subtilis*), temperature and the fermentation duration. *P. biglobosa* seeds were fermented at various temperature of 40 - 70 °C for five days (120 hours) with different concentrations of Inoculum. The proximate analysis shows that fermentation increased the percentage protein. Protein had the highest composition with about 51 % after 72 hours at the lowest fermentation temperature of 40°C.

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OPEN ACCESS 032069

Prediction of Early Age Strength of Concrete Using Statistical Method

M. C. Ogbodo, I. E. Ibigbani and A. I. Akpabot

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This research work presents the use of statistical method (regression analysis) to predict early age strength of concrete. Freshly prepared concrete samples were poured into cube moulds and exposed to pond curing for 7 and 14 days. NDT was carried out using Schmidt rebound hammer before subjecting the concrete cubes to DT method using compression machine. Mathematical models were developed to obtain the early age strength of concrete for different days. From the results, concrete cured for 14 days had higher strength values than those cured for 7 days. Also, the rebound hammer in the horizontal position yields a better representation of compressive strength than when placed vertically downwards. The cubic regression (0.0198) analysis is best for the prediction of the concrete strength for the 14 days curing.

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OPEN ACCESS 032070

Coal combustion models: A review

G.T. Marangwanda, D.M. Madyira and T.O. Babarinde

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Computational Fluid Dynamics has been used for optimisation of industrial applications with some level of success. The modest accuracy provided by some of the combustion models in use has left some room for research and improvement. Coal is presented as a fuel with complex chemical properties due to its fossil fuel nature. The devolatilization process of coal is investigated with special attention to the best models that can handle heavy and light volatiles found in coal. The heterogenous char combustion is also presented paying attention to the nature of the char particle during the combustion process. The other processes such as drying, homogenous volatile combustion, radiation models, particle tracking models and turbulent models are investigated in a general manner as they rarely vary with the type of fuel being investigated. A summary of the industrial applications that have successfully utilised the CFD models for optimisation of coal combustion are presented thus helping in drawing the final conclusion.

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Surface Protection of Carbon Steel with ZrO_2 Composite Induced Zinc Based Electrolytic cell via Electrodeposition Technique

O. S. I. Fayomi, O.O. Joseph, O. J. Fashola, A.P.I. Popoola, C.A. Loto, O.D. Samuel, S.O. Banjo, I.G. Akande, T.O. Joshua, M. Abdulwahab, O.P. Babalola, F. Ademuyiwa, A. A. Ayoola, T. Sanni and J. Fayomi

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The effect of Zirconium dioxide (ZrO_2) as additive to Zn-MgO electrolytic chemical bath coating by co-deposition on carbon steel was investigated. Weight loss was conducted on the electrodeposited mild steel and it was inspected. The anti corrosion properties were assessed by linear polarization procedure in 1 mole of HCl medium. From the results gotten, all deposited coatings displayed significant improvement. An amazing improvement was accomplished in every one of the coatings as against the as-received sample. Zn-MgO-ZrO_2 (0.8V) with the best performing coating showing an upgrade indicates enhanced anti-wear and friction qualities displaying wear resistance improvement.

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OPEN ACCESS 032072

Inventory replenishment in multi-stage production setting under stochastic demand: a review

O Ongbali Samson, S. A Afolalu, S Fayomi Ojo and S Oladipupo

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Inventory management is central to production planning and control particularly in multi-stage production environment where production output is stochastic and customer demand is also stochastic. Surplus inventory ties down money and stock-out situation result in loss of value and goodwill. Therefore, it is necessary determine optimal inventory policies for different manufacturing scenarios to maintain a balance between safety stock inventory and customer demand satisfaction at all time. Consequently, this review attempts to identify and document the underlying trends and

most recent methods of inventory replenishment under stochastic demand with emphasis on multi-stage production setting. Prominent in literature among the models used to treat inventory problem in stochastic demand situation is "Approximation by Probabilistic Distribution". Other models used include, Genetic Algorithm (GA), Just-in-time with Kanban simulation, Markov Process Decision, Fuzzy Inventory Model, Multi-stage inventory-queue model and Demand forecasting among others. It appears that there exist only approximate solutions than exact solutions in solving stochastic demand inventory problem suggesting that there is need for more work to be done in the area toward achieving exact solutions to the problem than approximation.

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OPEN ACCESS 032073

Prediction of the elastic behaviour of HDPE/SWCNTs nanocomposites with FEM approach

R.T. Tebeta, A.M. Fattahi and N.A. Ahmed

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Prediction of elastic behaviour of polymer-based nanocomposite using finite element method (FEM) has attracted the attention of many researchers in the past few years. In this study, ANSYS 19.2 software was used to predict the elastic modulus of high-density polyethylene (HDPE) reinforced with single-walled carbon nanotubes (SWCNTs) at different weight fractions. Three-dimensional (3-D) representative volume element (RVE) was created by FEM using ANSYS software to estimate the elastic modulus of HDPE based nanocomposite reinforced with SWCNTs nanoparticles at 0.2 wt%, 0.4 wt%, 0.6 wt%, 0.8 wt%, and 1 wt% weight fractions. To present the FEM model for predicting the elastic modulus of HDPE/SWCNT nanocomposite, the results from atomic modelling were extracted and used for properties of matrix and fibre interface. The interfacial region was used in the model to separate the conditions of load transfer between the HDPE matrix and SWCNT fibre. Two density fractions of HDPE/SWCNTs nanocomposite were also used in terms of two different densities for both HDPE and SWCNT to investigate their effect on the elastic modulus. The modelling results showed that the increase of weight fraction of single-walled carbon nanotubes (SWCNTs) results with the increase of relative elastic modulus of the nanocomposite. The results also showed that the elastic modulus of low-density fraction HDPE/SWCNTs nanocomposite improves more compared to one of the high-density fractions at the same SWCNTs weight fraction. Rule of the mixture was also used to predict the elastic behaviour of HDPE/SWCNT nanocomposite and the results were compared to those of the FEM model for validation.

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OPEN ACCESS 032074

Thermal Conductivity of Nanofluids in Heat Transfer Applications – A Review

U.K. Efemwenkiekie and S.O. Oyedepo

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The subject of nanofluid have been a major topic of research due to its numerous thermo-physical properties and several breakthroughs that have been recorded. Despite this, other challenges have also ensued. In this work, efforts were made to review the breakthrough, challenges that have been recorded in nanofluid applications as regards thermal conductivity. Thermal conductivity is a

significant criterion to consider when dealing with heat transfer related works and several factors affect the performance of this systems; factors such as temperature, nanoparticle size, the method of preparation of nanofluid, volumetric loading, nanoparticle shape and base-fluid used. The result of the review showed that despite the success recorded in enhancing of these systems; by employing nanofluid to improve these systems there are still challenges that portends from the use of nanoparticle. Hence the need for further researches to done in order to address these issues

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Investigation of the Catalytic Liquid System Ratio on the Strength Performance of Geopolymer Concrete

Solomon Oyebisi, Anthony Ede, Festus Olutoge, Tobit Igba, John Oluwafemi and Adekunle Ajao

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This study assessed the effects of the varying ratio of alkaline activators on the short-term mechanical property of slag-based geopolymer concrete (GPC) incorporated with corncob ash (CCA). Consequently, the study harnessed the waste products, eco-friendly and low-carbon footprint materials, ground granulated blast furnace slag (GGBFS) and corncob ash (CCA) as binding agents in a bid to design and develop a sustainable product. Moreover, sodium hydroxide (NaOH) solution and sodium silicate (Na_2SiO_3) gel were used as a catalytic liquid system (CLS) for the activation of the concrete products at the varying ratio of 1.5: 1, 2: 1, 2.5: 1 and 3: 1 for Na_2SiO_3 gel: NaOH solution respectively. Furthermore, GGBFS was replaced by CCA in 20, 40, 60, 80, and 100% volume using grade 30 MPa concrete (M 30) as a mix design proportion. The mix was activated with 14 molar concentrations of CLS. Subsequently, the concrete samples were cured under the ambient conditions and tested for compressive strength at 7, 28, 56 and 90 days. The experimental finding revealed that the optimum strength performance of slag-based GPC incorporated with CCA is achieved at a ratio of 2.5: 1 for Na_2SiO_3 gel: NaOH solution respectively when compared with 1.5: 1, 2: 1 and 3: 1 for the concrete. Therefore, the strength performance of GPC depends on the varying ratio of alkaline liquid and must be properly experimented to ascertain its best performance on the strength properties of GPC.

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Experimental Investigations of Tool Pin Geometry and Process Parameter Influence on Mechanical Property of Friction Stir Welded 6101-T6 and 7075-T651 Aluminium Alloys

Olatunji P Abolusoro and Esther T Akinlabi

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One of the variables that significantly affect the joint integrity of welds carried out with friction stir welding (FSW) is the tool pin geometry. This particular factor considerably affects the mechanical properties, joint size and microstructural evolution of the weld. The extent to which tool geometry affects the mechanical behaviour of welds under different processing parameters needs to be fully understood in order to achieve highly reliable joints for various industrial applications. This work is, therefore, an attempt at, investigating tool pin geometry and processing parameters effects on the mechanical behaviour and stability of friction stir welds through joining of 6101-T6 and 7075-T651

aluminium alloys via FSW. Two pin designs named tapered unthreaded and tapered threaded were used for this study. The result obtained shows that low rotational speed and high welding speed promote the tensile strength of the welded alloys and that welds carried out with the tapered threaded tool gave higher tensile values than the tapered unthreaded.

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Adsorption assessment of the inhibitive effect of *Crateva adansonii* on low carbon steel in acidic medium

A.B Anwo, K.O. Ajanaku, A.A. Akinsiku, O.S.I Fayomi, A. Olanrewaju and C.O Ajanaku

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This paper outlines the unique role of *Crateva adansonii* (CA) leaf extract on low carbon steel in corrosive media. The defensive ability of *Crateva adansonii* extract was evaluated by gravimetric and gasometric techniques. The result of the experiment indicated that extract of *Crateva adansonii* exhibit perfectly well on the steel due photochemical species containing in the inhibitive extract thereby blocking both the anodic and cathodic site. The mixed Inhibitive effect of *Crateva adansonii* were investigated by the kinetic state. The adsorption studies of CA leaf extract obeyed the Langmuir, Freundlich, temkin isotherm but best fitted into Langmuir adsorption isotherm which characterised by physisorption. The range of E_a values (from 46.09 kJ/mol to 60.58 kJ / mol) in the presence of the extract being higher than the free solution. Which suggests strong physical adsorption (physisorption).

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OPEN ACCESS 032079

Production of Adhesive from Cassava Starch

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The research work investigated the production of adhesive from cassava starch. Cassava tubers were processed into starch-based adhesives, using two different gelatinization enhancers (that is HCl and NaOH) which were introduced separately. The adhesives were produced by considering two varied process parameters, namely percentage weight of borax in starch solution (8 – 20%) and reaction temperature (65 – 85°C). Comparative analysis of the adhesive obtained (using HCl and NaOH as gelatinization enhancers) include the determination of its bond strength, viscosity, drying time, pH and density. As the borax weight percent increases up to 14 % and reaction temperature reduces (using NaOH) the drying time increases, while the drying time reduces as both the borax weight percent and temperature reduce (using HCl). The results of the adhesive physical properties fall within the standard range for each of the properties and this implied that the adhesive produced was of high quality.

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Exploring Neural Network to Predict Car Tyre Inflation Time and Power Requirement of a Tyre Pressure Control Unit.

S.T Amosun, O.D Samuel, P.T Zubairu, B.O Bolaji and S.O Fayomi

This study used Artificial Neural Network (ANN) for the prediction of power required to inflate different tyre sizes and inflation times. ANN is a widely accepted machine learning method that uses past data to predict future trend. An existing database obtained experimentally from a tyre pressure control test rig was optimized using genetic algorithm(GA) which is an optimization tool that can find better subsets of input variables for importing into ANN. The ANN results were compared with the results obtained experimentally. The results show that the model can be implemented in modern day tyre pressure control designs and be used to predict inflation times and power required to inflate different tyre sizes.

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OPEN ACCESS 032081

Kinetic Study of Waste-derived Solid Hydroxy Sodalite Catalyst during Transesterification of Animal Fat Oil to Biodiesel in a Batch Reactor

T.C. Aniokete, S. Mbhele, V. Mdlalani, M. Ozonoh and M.O. Daramola

Kinetic studies of heterogeneous catalytic reactions form a crucial step necessary for the understanding of catalytic behaviour of a catalyst towards designing, controlling and optimizing a reactor. This study reports kinetics of waste animal fat oil (AFO) transesterification to biodiesel using waste-derived heterogeneous catalyst, hydroxy sodalite (HSOD) in a batch reactor. The catalyst was synthesized from coal fly ash and waste industrial brine via hydrothermal treatment. At a temperature range of 49 - 62 °C and a time range of 30 -120 minutes, the transesterification of animal fat oil to biodiesel was conducted at a fixed methanol/oil mass proportion 9:1, percent mass weight of catalyst 3 (based on the AFO) and stirring intensity of 300-500 rpm. Experimental findings reveal that reaction rate, which is first-order, was anticipated to increase with increasing temperature, resulted in an activation energy and a pre-exponential factor of 58554.65 J mol^{-1} and 2.83 min^{-1}, respectively. The value of the activation energy suggests that the reaction is endothermic and a minimum energy of 58.55 kJ is required to achieve an effective collision at a frequency of 2.83 min^{-1}. The highest biodiesel yield was 90 % at 62 °C and this corresponds to a highest AFO conversion of 93 % at a reaction time of 120 minutes.

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Monte Carlo Method of Shrinking Direction on Rectangular Slab of Fixed Boundary Condition

N. E. Udoye, A. A. Dare, O. S. I. Fayomi and S. O. Banjo

The study of heat transfer is crucial for its proper implementation in engineering design process. The Shrinking Boundary Monte Carlo Method was applied to evaluate temperature distribution in a Spiral, vertically up and vertically down running direction. The outcome was equated to normal

Monte Carlo Method. The results revealed that increasing the size of the rectangular slab will increase the running time to compute temperature distribution. In a given direction of running, it has different temperature distribution for the different sizes of the slab. The computational run time for a rectangular slab in a portrait shape is greater than rectangular slab in a landscape pattern. The study proved that the average of the run time for various direction of movement indicates that spiral is shorter. It is the best ways of computing temperature dispersal in a rectangular slab of fixed boundary condition. The utilization of the shrinking boundary to analyse heat transfer was successful.

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OPEN ACCESS 032083

Physical, chemical and mechanical properties of corn sheath as pulp and paper raw material

E. E Alagbe, E. S. Bassey, O. E. Daniel, M. B. Shongwe, M. E. Ojewumi and C. C. Igwe

Most papers are made from virgin wood-based pulp of hardwood sources but recently, softwood have received enormous attention as alternative to hard wood because the hardwood takes a significant number of years to mature enough for use in the pulp and paper industry unlike softwood which are majorly annual plants. The annual crop in focus in this work is the yellow open-pollinated variety of corn which generates tons of waste at harvest. A novel attempt is made to ascertain the viability of corn sheaths as raw material for the pulp and paper industry by carrying out a comprehensive analysis on the pulp and paper made from the pulp. The sheaths were dried, shred and cut into pieces suitable for the digester and the pulps obtained were analysed for physico-chemical properties. Hand sheets were also made using the generated pulp and its physico-mechanical properties were analysed. Results obtained were compared with pulp from corn husks from other parts of the country, three Nigerian fibre sources – silk cotton, bagasse and rice straw and other foreign non-wood sources and found to be of competitive properties. Pulp properties of Lignin content, ash content, cellulose, hot and cold water solubility of the fibres were 13.72 ± 1.21%, 1.27 ± 0.23%, 53.26 ± 1.11%, 15.20 ± 2.11 and 6.14 ± 2.43 respectively while the mechanical properties of paper from the pulp were Bursting strength (282.163 KPa m^2/g), Tear strength (146.119), Tensile strength (257.6N/m) and Tensile Index (3.9Nm/g). It was found that in all properties, the corn sheath was better than the rice straw fibers but not as good as the silk cotton and bagasse fibers. However, the corn sheath has been identified, as a viable raw material for the pulp and paper industry in Nigeria.

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OPEN ACCESS 032084

Reconnaissance Study of Smectite ores of Lafarge- Ewekoro, Ogun State Nigeria for Industrial Applications

A. O. Inegbenebor, A. I. Inegbenebor, E. I. Ajayi, O. Aladesuyi, O. M. Ogunleye, O. S. I. Fayomi, P. O. Babalola, A. J. Omoleye, H. I. Boyo and A. A. Adebesin

This work aimed to study the aluminosilicate ore contents at Lafarge Ogun State environ as a means of identification of background variation of smectite in the ore-bodied environment. Smectite clay samples (bentonite) were collected from Larfarge Ewekoro environ, while zeolite used as a standard

in this work was obtained from Petroleum Department of Covenant University for comparism purpose. The samples were digested with nitric acid, HNO_3 and hydrochloric acid, HCl, after which the digested samples were characterized with, ultraviolet visible (UV-VIS), scanning, absorbance; and % transmittances. The results revealed similarity in ultraviolet visible for bentonite and zeolite with predominance of iron in bentonite samples. The colouration of bentonite due to the presence of transition metals in the environment under study could be of industrial uses in the manufacture of coloured wares and tiles, and magnetic ceramic, though further pre-application specific investigations are recommended. Also, the observed properties favour many aspects of industrial applications such as in pharmaceuticals, refractories, adhesives and porcelain wares. These will help in setting up small and medium-sized enterprise in this area resulting in employment creation and revenue generation.

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OPEN ACCESS 032085

Fantasy theme analysis: rhetorical visions of political corruption in nigerian newspapers

Tayo-Adigboluja Afolayan, Okorie Nelson, Oredola Opeyemi and Ada Peter

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This research lays emphasis on predominant corruption stories in popular Nigerian newspapers, by means of fantasy-theme analysis in reviewing issues that concern corruption within the Nigerian political sphere. Particularly, this analysis compares stories about Nigerian politicians who have been reported at various points in time by Nigerian newspapers as corrupt individuals, who in one way or the other were found guilty of syphoning funds and falsifying relevant information. Through a thorough examination of fantasy themes roles on these accounts and recognizing which parts of reality are significant, we conceive what the messages are able to achieve with regards to the creation of rhetorical visions within contexts of symbolic convergence theory. In this study, fantasy themes analysed disclose meanings regarding morality, personal decisions, and class privilege. This study also highlights how stories on corruption cases by political leaders could help in the establishment of proper, honourable societies that punish or reprimand certain corrupt behaviours via normative impact on audiences. Fundamentally, rhetorical visions derived in this paper suggest that decision to be corrupt or not, as a politician lies with the politician himself.

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OPEN ACCESS 032086

Stabilizing Wave Attenuation Effects In High-Speed Metal Cutting

C. G. Ozoegwu, J.L. Chukwuneke, I.P. Okokpujie and K. O. Babaremu

− Hide abstract PDF

Theory of chatter-suppressing wave attenuation effects in high-speed metal cutting process is presented in this work. Analysis shows that rise in natural frequency of cutting tool leads to rise in the wave attenuating forces. This result leads to the postulation that rise in natural frequency suppresses high-speed chatter instability. The theory is based on the assumption of very short free-flight of cutting tool, and shown to fail when this assumption is violated. The concluding opinion becomes that the resistance of a high-speed tool to chatter stems from both structural damping and wave attenuation effects.

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OPEN ACCESS

032087

Experimental Comparison of Video Streaming Platforms and Devices with Objective Quality of Experience Metrics Towards Reliable Multimedia Applications in Education

Emmanuel Adetiba, Matthew B. Akanle, Daniel T. Babalola, Victor Akande, Peter Sheidu, Bolaji Ariyo, Surendra Thakur and Jules Raymond Kala

− Hide abstract PDF

This paper presents the result of experimental comparison of the video quality of streamed videos using streaming devices and streaming platforms. The objective metrics considered for the comparison of these media are the Peak Signal-to-Noise Ratio (PSNR), Structural Similarity (SSIM), Visual Information Fidelity (VIF), Information Fidelity Criterion (IFC), and Visual Signal-to-Noise Ratio (VSNR). To determine the better platform for effective multimedia applications especially for educational purposes, videos were obtained and streamed via Data video, YouTube and Facebook. In the first two scenarios, Data video at two different settings were engaged at the encoding end and PotPlayer was used for decoding and recording of the transmitted videos. In the third and fourth scenarios, Videos were streamed via YouTube and Facebook. The aforementioned objective metrics were implemented in MATLAB R2017b for the experimental analyses and our results showed that YouTube produced streamed videos of the best quality with PNSR of 37.98, SIMM of 0.98 and VSNR of 33.12.

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OPEN ACCESS

032088

The Influence of Meteorological Features on the Performance Characteristics of Solar Photovoltaic Storage System

Afolabi Gbenga, Orovwode Hope, Abdulkareem Ademola, Adoghe Anthony and Matthew Simeon

− Hide abstract PDF

Over the years, there has been increasing interest in exploitation of renewable energy source (RES) as a result of fast depletion of fossil fuel based conventional power generation with attendant negative environmental impact. However, renewable energy sources such as solar, wind, biomass etc are not always available because of their fluctuating nature. In view of this, it has become imperative to have an efficient energy storage system (ESS) for sustained energy availability. Batteries storage often suffers early failure due to irregular charge and discharge cycle which could eventually shorten its life span. Therefore, this research focuses on investigation of the influence of meteorological parameters on battery storage in solar PV system as well as evaluating the influence of these factors on the performance characteristics of solar PV storage system. The work examines particularly the effect of varying solar temperature and irradiance on the system output charging current and overall efficiency. A modified mathematical model of a solar PV was developed to show the relationship between meteorological parameters (irradiance and temperature), and PV output short circuit current. Analysis of meteorological data obtained for determination of state of charge (SOC) of battery storage based on the six geographical areas in Nigeria revealed that, in Bornu state (North-east) the battery attained 100% (hundred percent) state of charge in1Hr (one hour), while in Plateau state (north-central), the battery attained 60% (sixty percent) state of charge in 8hrs (eight hours), being the least in terms of charging rate. In Kaduna (North-west) region, the battery attained 88%

state of charge in one hour and 96% SOC after duration of eight hours. This is quite different from Lagos (Southwest), where the battery SOC in one hour was 38% and 78% SOC in eight hours. This phenomenon therefore, revealed that solar PV system implementation should be site specific and it also account for the life span of the storage and the system efficiency.

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OPEN ACCESS 032089

Thermal Modelling for A Pilot Scale Pyrolytic Furnace for Production of Carbon Black

Felix A. Ishola, Anthony O. Inegbenebor and Festus A. Oyawale

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Carbon black (CB) is a very important material useful for various modern applications. There are a lot of attention currently on the extraction of a form of CB obtainable from waste tyres which is usually referred to as pyrolytic Carbon black (CBp). The authors investigated the pyrolysis process of a pyrolytic furnace built for the production of CBp using the thermal numerical principles to standardise the application. SolidWorks@ Flow Simulation software was used to replicate the process by supplying the initial conditions, the boundary conditions and the operating conditions guided by the numerical analysis. The simulated behaviour of the furnace was validated by the real-life experiments performed to produce CBp from the waste tyre.

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OPEN ACCESS 032090

Predicting the Quantity of Municipal Solid Waste Required for Power Generation Using Power Plant Design Parameters

R. A Ibikunle, I.F Titiladunayo, D. C Uguru-Okorie, C.O Osueke and A Olayanju

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In energy recovery technology, via municipal solid waste (MSW) as an energy resource; the capacity of the power plant required can be designed, if the potentials of the heat and electrical energy of the waste to be combusted has been established. Conversely, in this research, the amount of power potential of the waste required as fuel, is determined through the design for the capacity of the steam power plant that will utilize municipal solid waste as an energy resource. The capacity of the power plant is designed, using single reheat Rankine cycle. The pressure and temperature selected for the design of the boiler is 30 bar and 400 °C, the pressure at the reheat tube is 6 bar, and the pressure at the condenser is 0.032 bar. The heat supplied to the boiler is calculated to be 3639.2 kJ/kg, the total work-output of the turbine is 1451.4 kJ/kg and the heat rejected at the condenser is 2187.6 kJ/kg. The quantity of MSW required is predicted to be 418 MJ/kg based on the calorific value of 20 MJ/kg, and its heat energy and electrical power potentials is predicted to be 2.3 GWh and 29 MW respectively while the grid to power is 20 MW.

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OPEN ACCESS 032091

Design, Development and Performance Evaluation of A 5-Ton Capacity Brinell Hardness Testing Machine

A.A Awe, S.M. Adedayo and T.S. Olabamiji

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Material testing machines are necessities in structural metal industries and engineering training institutions. Cost of importations had however made acquisition of the equipment difficult in most developing countries. This research aims at developing a hardness testing machine with 100% locally sourced components with a level of accuracy comparable with globally recognized manufacturers of similar equipment. A 5-Ton capacity Brinell-type hardness machine was designed, developed and tested. The machine has dimension specification: Base (602mm × 602mm); Height (1219.2mm). Total weight is 135kg. The cubical frame is made of two structural I-channel of depth (600mm) ×width (65mm) ×web (5mm). The horizontal I-channel that absorbs the bending load is of specification 600mm Depth ×65mm width×5mmWeb. Design indentation load of 50000N transmitted at the centre of I-channel was used resulting in maximum stress of 48.5N/mm^2. A 5-Ton hydraulic jack, with attachments for workpiece support is placed rigidly on the lower I-channel. Sperical steel ball from ball bearings was used as indenter ball, positioned in a casing and rigidly fixed to the upper channel of machine in inverted position. Hydraulic jack pressure was monitored through a oil pressure meter connected through an orifice at the base. An upward movement of the ram lifts workpiece against stationary indenter. Indentation diameter on workpiece is measured with a micrometer travelling microscope. Repeated tests carried out on Aluminium, Copper and plastic gave diameters 2.9, 3.2, 7.5mm coressponding to 74.098, 60.56, 9.5BHN. Similar tests carried out on Brinell Hardness Tester Model (EEDB) and serial number (EEDB/13) give 79.6, 69.1, 9.5BHN percentage variation of locally developed machine from the standard machine used were 6.91, 12.36 and 0%. The effect of applied indenter force on hardness value was examined and results showed a maximum range of 1.428 BHN standard deviation. Test results indicated good reliability for use in basic material testing.

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OPEN ACCESS 032092

A Systematic Mapping Study of Cloud-native Application Design and Engineering

Isaac Odun-Ayo, Rowland Goddy-Worlu, Lydia Ajayi, Boma Edosomwan and Fiona Okezie

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Cloud computing is a desirable paradigm that is providing services to users in a convenient manner and ensuring that Cloud service providers have value for their infrastructure. Applications designed to run explicitly on the Cloud are usually referred to as Cloud-native applications. Determining a research focus in a particular field of study is sometimes challenging. A systematic mapping study gives an insight into the research level that is being conducted in any field of interest. The results generated from such study are presented using a map. The method used in this study was analyzing three facets categories namely, topics, research and contribution. Topics were retrieved from primary studies, while type of research such as evaluation and contribution such as tool, were used in the analysis. The objective of this study is to conduct a systematic mapping study of Cloud-native applications designs and engineering. This will provide an insight into the frequency of work that has been done in cloud-native applications area. The results showed that from publications relating to security in the field of metric (1.94%), more articles in the topic of application in terms of tool (13.59%), more work done on architecture in terms of model (15.53%), more papers published on Cloud migration in the area of method (10.68%). Furthermore, 11.82% publications were identified on applications in terms of evaluation research, more publication on implementation in the area of

validation research (1.82%), more publications on implementation in solution research (6.36%), more publications on security and application with respect to philosophical research (1.82%) and more work done on applications in terms of experience research (6.36%). From the study, several gaps were identified which would be beneficial to researchers, practitioners and providers.

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OPEN ACCESS 032093

Evolution of surface roughness and mechanical properties of Sputtered Aluminum thin films

F.M. Mwema, E.T. Akinlabi and O.P. Oladijo

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In this work, aluminum thin films were sputtered on steel substrates at a varying substrate temperature ranging between 40 and 100 degrees Celsius. The films were characterized for microstructure by field emission scanning electron microscope, topography by atomic force microscope, mechanical properties by nanoindentation and the results related to the wear behavior of the films under very high sliding load of 30 N. The mechanism of failure of such films were observed and the relationship between the substrate temperature and sliding failure discussed. The study is important in understanding the failure mechanisms and improvement of the surface properties of sputtered aluminum thin films.

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OPEN ACCESS 032094

Effect of punch force on the upsetting deformation process using three-dimensional finite element analysis

F.M. Mwema, J.O. Obiko, E.T Akinlabi, S.A. Akinlabi and O.S. Fatoba

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Forging is one of the conventional shaping technologies that is widely used for the manufacture of quality products for various industrial applications. The process involves the mechanical application of a punching force to deform a material to the desired shape and improved properties. In most cases, the manufacture of quality products depends on the experience of the designer and trial and error method thus making the process wasteful and costly. The present study reports on the application of finite element method (FEM) for the analysis of the effect of punch force on the stress/strain distribution during the deformation process as a step towards the reduction of trial and error methods in practice. The results show that increase in the punch force leads to inhomogeneity in the strain/stress distribution due to change in the deformation temperature resulting from the internal heat generated during plastic deformation stage and the frictional force at the punch-workpiece interface. It is also observed that the maximum effective strain occurs at the center of the deformed sample and the maximum effective stress occurs at the low effective strain regions. Moreover, the friction parameter increases as the punch force increases.

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OPEN ACCESS 032095

GatingPractices in Nigerian Research and Training Institutes: Case Study of Lagos State

O. A Adefuye, J.I Orisaleye, O.I Lawal and O. L Fadipe

Foundry practice have existed in Nigeria for centuries. However, for the development of the practice, know-how and skills must be developed. Personnel must be trained at all levels. In this study, the practices in foundries of research and academic institutions involved in foundry within Lagos state were investigated. Investigations were carried out by on-site study of the foundries and also by means of questionnaires investigating various aspects of foundry practice. From responses obtained, it was shown that the capacity of foundries to produce technically sound castings is very low. Simple steps capable of increasing the quality and reproducibility of the castings were suggested. It was concluded that students' learning and local foundry practice can be enhanced by upgrading foundries in research and educational institutions to current global best practices.

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OPEN ACCESS 032096

Reliability Comparison of Schmidt Rebound Hammer as a Non-Destructive Test with Compressive Strength Tests for different Concrete Mix

O. D. Atoyebi, O. P. Ayanrinde and J. Oluwafemi

One of the most important concrete properties for structural concrete design or redesign is the compressive strength, it gives information on the characteristics of concrete. This strength measure is obtained through standardized crushing tests on cast cubes, the cubes are produced alongside the construction of concrete elements on site however they are not available for strength testing of existing buildings henc3e the need for non-destructive test methods. Schmidt's Rebound Hammer is a nondestructive test which is used to assess the compressive strength of concrete using rebound index. Surface hardness test was done on different concrete mix and compared with cube compressive strength tests. The changes in one variable explained by the change in a related variable as given by the R-squared are 93.79%, 99.42%, 86.8%, 1% and 98.5% for Mix 1, 2, 3, 4 and 5 respectively. It is noted that for proper result from non-destructive tests, more than one should be implored and the model calibration should be based on actual compressive strength.

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OPEN ACCESS 032097

Designing Optimized Organic Rankine Cycles Systems for Waste Heat-to-Power Conversion of Gas Turbine Flue Gases

A.B. Fakeye and S. O. Oyedepo

The focus of this work is to develop a flexible ORC design procedure that compares thermo-economic performances of simple and recuperative ORCs for both subcritical and supercritical cycles through a multi-objective optimization that relates the economic parameters to the network output for waste heat-to-power conversion of exhaust gases. Few researches have proposed rather simpler methods by modifications to the Jacob number (Ja) but these are insufficient to make technical and economic decisions on the subject matter as Ja is only appropriate for comparing performances of

different working fluids at the same operating condition. Coupled with the barrier on the minimum temperature the exhaust gases from power plants may attain, the use of Ja as the only criteria is not sufficient for varying operating condition presented by Gas Turbine power plants. Hence, this review presents follow-through numerical methodology for designing adapted ORC for waste heat-to-power energy conversion.

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OPEN ACCESS 032098

Intelligent Shunt Fault Classifier for Nigeria 33-kV Power Lines

A. A. Awelewa, P. O. Mbamaluikem and O. S. Aderemi

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This paper presents a new approach to using artificial neural networks (ANNs) in improving the protection of transmission lines. The proposed method uses instantaneous values of voltages and currents during normal and fault conditions on a transmission line as inputs to four different neural network structures. The structures are then aptly combined to yield a system that can detect and classify shunt faults with improved efficiency. The details of the design procedure as well as various simulations carried out are provided in the paper. The performance of the developed system is evaluated using two performance indices, viz., accuracy and mean square error (MSE), and the results show that this approach is capable of detecting and classifying all possible shunt faults on the 33-kV Nigeria power lines in less than 1ms with high level of accuracy.

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OPEN ACCESS 032099

Two-Body Spinless-Salpeter equation of unequal masses interacting with Coulomb-Hulthẻ n potential

C.A. Onate, O.S. Obaseki, M.C. Onyeaju, A.N. Ikot, O. Ebomwonyi and N.K. Oladejo

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We obtained the analytical solutions of the two-body Salpeter equation via the methodology of supersymmetric quantum mechanics under a combination of Coulomb and Hulthén potentials for unequal masses. We clearly examined the energy eigenvalues for the ground state and excited states. The behaviour of energy with the sum of the masses and the screening parameter respectively, were also studied. The results showed that two bodies of unequal masses interacting within the system exhibit the same features.

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OPEN ACCESS 032100

Multi-Criteria Decision Analysis Towards the Selection of a Perfect Location for Establishing Crude Oil Refinery in Niger Delta Nigeria

I.P. Okokpujie, U. C. Okonkwo, E.T. Akinlabi, K. Okokpujie and A. A. Atayero

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Crude oil refinery is a significant manufacturing company in Nigeria, which when properly build in a good location, it will help to stable the economic instability in the country. As the end product of the crude oil process is used for different purposes such as, transportation, cooking, electricity generation and for industrial application, which will help to improve the daily living of the Nigerians. This work presents a multi-criteria analysis method for suitable selection of the refinery location in Niger Delta, Nigeria. The suggested location principle takes into consideration the technical aspect of the Environment. The four interest considered in this work are economy factor, nearness to other felicities, environment impact and traffic impact. These interest were examined for three locations alternative such as Delta state, Bayelsa state and Akwa-ibom state using Analytical Hierarchy Process (AHP) to assign weight through pair-wise comparison and Multi-criteria decision-making tool to make a suitable selection. The analytical results show that Akwa-ibom state has the highest aggregative value of the rated score of 539, Delta state of 482 and Bayelsa state of 438. The result derived from this study as proven that AHP method for selection decision making is reasonable and obtainable for refinery selection location.

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OPEN ACCESS 032101

Empirical Modelling of a Prototype Resistance Spot Welding Machine

C. G. Ozoegwu, C. N. Oti, I. P. Okokpujie and E. T. Akinlabi

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Resistance spot welding (RSW) has been extensively used in the automotive and aerospace industries over the years. The weld quality of spot welds is affected by the welding parameters like electrode force, weld time, electrode current and workpiece size/shape parameters like workpiece thickness. This study focuses on the effect of electrode force, weld time and workpiece thickness on the weld quality of mild steel samples where the aim is to correlate the weld strength to welding parameters of a portable RSW machine installed at the Nigerian Liquefied Natural Gas (NLNG) laboratory of the Department of Mechanical Engineering, University of Nigeria, Nsukka. Lap shear weld samples are tested for strength, and the results are used to develop an empirical model. The developed model has a coefficient of determination of 0.6365 and a correlation coefficient of 0.7978. Hypothesis testing at 5% significance level discovered that the most significant predictor is the cross interaction of the workpiece thickness and electrode force with p-value of 0.02367 and that the model is significant with a p-value = 0.0453. The model is validated by further welding operations and tensile shear tests which gave a percentage error not exceeding 12.92% but was as low as 6.35%.

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OPEN ACCESS 032102

Vision Algorithms for Sensing Soft Robots

Victoria Oguntosin, Ayoola Akindele and Olaitan Alashiri

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The aim of this paper is the presentation and verification of computer vision algorithms in order to measure the geometric parameters of soft robots. The materials from which soft robots are made from possess large deformations. Embedded sensors or visual processing algorithms are often used to obtain measurement performance data from these robots. Integration of embedded sensors with soft

robots can be cumbersome and expensive, also limiting the performance of a soft actuator. In this paper, implemented visual processing algorithms (thresholding, SAD, SSD and ZNCC) to measure performance data such as angle of motion, degree of bending, radius of curvature in real-time implemented with OpenCV libraries and Webcam is described. Soft RGB colour markers were also produced and firmly glued into the body of the soft robot with no hindrance to movement. Some concepts of visual processing applied include colour tracking, template matching and camera calibration. The execution of vision based motion control to a variety of soft actuators such as bending and wedge-shaped soft actuators was described.

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OPEN ACCESS 032103

A Review of the Compositions, Processing, Materials and Properties of Brake Pad Production

S.S. Lawal, N.A. Ademoh, K.C. Bala and A.S. Abdulrahman

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This is a review and overview of the trending researches in automobile brake pad production processes, formulations, materials, and properties. Most of the works attempt mainly on replacing asbestos found to be carcinogenic with base materials with other ingredients in various formulations and particle sizes. Though most of the replacements are non-hazardous with properties such mechanical and tribological cauterizations comparing well with the traditional asbestos based brake pad. The overview of these trends suggests the need to replace not only the asbestos but also the commonly used epoxy resins or phenolic resins or phenol formaldehyde binders that has been found to corrode outside plates of brake assembly. These reviews has thrust a new research direction of replacing the asbestos and inorganic resins with agro based materials of Cashew Nut Shell and Plant Gum binder respectively to obtain a substantially green based brake pads that are non-injurious to human health and does not corrode any parts of the brake pads assembly.

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OPEN ACCESS 032104

A Proposed Mobile Voting Framework Utilizing Blockchain Technology and Multi-Factor Authentication

T. P. Abayomi-Zannu, I. A. Odun-Ayo and T. F. Barka

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Voting is fundamental to any consensus-based society and is one of the most critical functions of democracy. Mobile voting (m-voting) was utilized as a means for voters to easily and conveniently cast their votes using their mobile devices which have been the most adopted means of communication but has a major problem which is safely securing the casted votes and avoiding any form of tampering. In this paper, we propose an m-voting framework that utilizes blockchain technology to securely store the casted votes and multi-factor authentication to authenticate the voters before they cast their votes while also providing an easily accessible, secure and transparent m-voting system.

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outstanding corrosion and microhardness properties was developed by means of spark plasma sintering technique (SPS) was synthesized. The effect of sintering temperature was investigated on microstructure, densification, microhardness and corrosion resistance properties of the synthesized alloy. The microstructural evolution and phase identification were characterized using the scanning electron microscope (SEM) equipped with the energy dispersive spectroscopy (EDS) and X-ray diffractometer (XRD) respectively. Ordered FCC and BCC systems were identified along with clearly defined crystal grains along with Mo, Ti and Si rich regions. No cracks or initiation of stress were revealed from the microstructures. Maximum relative densities of 98.4% resulted in microhardness of 960.09 HV were achieved at sintering temperature of 1000°C. The $Ti_{25}Si_{25}$ $Al_{20}Mo_{20}Ni_{10}$ HEA fabricated at 1000°C displayed a higher polarization value of 3477 Ω.

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OPEN ACCESS

042003

Climate change and business activities: a case of cassava farmers in Ogun state, Nigeria.

Udoh Iboro Paul, Adedeji Saidi Adelekan, Benneth Uchenna Eze and Sunday Dorcas Kolo

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Climate change is an observable variation in the climate systems that are attributable to human (anthropogenic) activities and natural process (biogeographical), which alters the atmospheric composition of the earth and ultimately leads to global warming. The relationship between climate change (measured by increasing temperature trend and decreasing rainfall trend) and the business activities of cassava farmers in Ogun State, Nigeria appears not to have been fully examined; this study examines the relationship between climate change and the business activities of Cassava farmers in Ogun State.

This study employs survey research design, through the administration of structured questionnaire to cassava farmers in Ijebu-Igbo, Ogun State. The research instrument (questionnaire) was validated using content validity index, through the assessment of five academics staff (in the departments of business administration and agriculture) at Olabisi Onabanjo University, Ago-Iwoye and Ibogun Campus, Ogun state, while the reliability of the instrument was tested through test-retest method by conducting a pilot study. The instrument was administered twice within an interval of two weeks and the outcome of the first pilot study was correlated with that of the second and a Cronbach alpha of 0.79 was obtained, which indicated that the instrument is reliable. The regression model was tested using categorical regression with the aid of STATA version 14.

The findings revealed that climate change is negatively related to the business activities of cassava farmers in Ogun State with coefficient and probability value of: increasing temperature trend (-0.54, p-value<0.05) and decreasing rainfall trend (-0.72, p-value<0.05). It can therefore be concluded that increasing temperature trend and decreasing rainfall trend, have an inverse relationship with the business activities of cassava farmers in Ogun State, Nigeria. It is recommended that the government should come up with eco-friendly policies as well as liaising with other nations to combat global warming as well as creating irrigational facilities to augment decreasing rainfall, cassava farmers should maximize the use of the raining season as well as creating small irrigational facilities.

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OPEN ACCESS 042004

Seismic Retrofitting: A preparatory approach against the forecasted quakes in the South-Western Part of Nigeria.

John Oluwafemi, Anthony Ede, Olatokunbo Ofuyatan, Deborah Bankole, Solomon Oyebisi and Olumoyewa Atoyebi

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The seismic record of Nigeria shows the occurrences of quakes that range from small to medium magnitude as against the belief of some people that Nigeria is aseismic. Researchers in Nigeria have also recently raised alarm that devastating earthquake is likely to be experienced in the nearest future with attention drawn to the south west in Nigeria. The historical seismic data as published in this work had the sizes of quakes presented using the intensity scale. To further give us clarity into the actual sizes of the documented quakes, the intensities were converted to local magnitudes, hence the minimum and maximum quakes ever witnessed in Nigeria were ascertained to be 3.3Ml and 6.5Ml. In response to the seismic alerts and forecast results targeted at the south-west region of Nigeria, seismic retrofitting is recommended for the existing structures along the seismic fault in the south west while the response results published in the works of [1] is recommended as guides to the designs of subsequent structures along the fault in the south west so as to establish safety just if the forecasted quake is experienced.

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OPEN ACCESS 042005

Corrosion Inhibitory properties of *Biden pilosa* Plant Extract on Mild Steel in Acidic Media

S. O. Ajayi, T. O. Ademosun, E. R. Okoro, C. O. Ajanaku, R. C. Mordi and K. O. Ajanaku

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A study on the inhibitive properties of *Biden pilosa* plant extracts on mild steel in 1.75 M HCl was embarked upon in this research using gasometric and potentiodynamic polarization technique at room temperature. The mild steel coupons were dipped in 1.75 M HCl blank and altered concentration of *Biden pilosa* plant extract (10%; 20%; 30%; 40% and 50% v/v). The rate of reaction between the acidic extract and the mild steel coupons gives the volume of hydrogen gas given off during the reaction. The observed inhibition efficiency using gasometric method indicated a direct relationship with upsurge in concentration of the inhibitors up to 50% concentration for *Biden pilosa* extracts. A comparable trend was observed in the Tafel plot using the polarization technique. The adsorption study revealed the use of *Biden pilosa* extract followed the Langmuir isotherm principles (chemisorption). The use of *Biden pilosa* extract is hereby proposed as good inhibitors for mild steel corrosion at 1.75 M HCl environment.

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OPEN ACCESS 042006

Innovative Approach for the Management of Faecal Sludge Accumulated in Ventilated Improved Pit Latrine: A Case Study of eThekwini Municipality in Durban South Africa

B.F. Bakare

− Hide abstract PDF

The provision of sustainable sanitation service to all South Africans has become one of the government national priorities. This is because the government recognizes that all citizens of the country has the right to basic sanitation that is affordable, appropriate, socially acceptable and sustainable in the long run. Ventilated Improved Pit latrines (VIP) has been considered to be the minimum acceptable level of sanitation service. However, the provision of appropriate sanitation service in the form of VIP latrines to all goes beyond building the toilets, plans should be put in place by municipalities are for adequate operation and maintenance of the toilets before and when the toilets reaches their capacity. Major challenges faced by many of this municipalities which is also common in many developing countries is that, this on-site sanitation systems eventually becomes full to their capacity and if there is no long-term maintenance plan in place, this system becomes unusable and eventually leaves the household without an effective basic sanitation system again. This paper present innovative approaches that have been considered for the operation and maintenance of Ventilated Improved Pit latrine in and around eThekwini Municipality in Durban, South Africa.

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OPEN ACCESS 042007

Polyhydroxyalkanoate: a biodegradable polymer (a mini review)

A. B. Akinmulewo and O. C. Nwinyi

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The current synthetic plastic menace has driven researchers to sort sustainable alternatives. Polyhydroxyalkanoate (PHA) has been proven to be sustainable, biodegradable, biocompatible and hence could serve as suitable alternative. PHAs are biodegradable polyester produced by microorganisms that can be produced from renewable substrates such as starch and plant oils. These biopolyesters are accumulated in the intracellular granules and serve as carbon reserve for bacteria. Current studies show that there exists about 150 different monomers of PHA with shared properties similar to synthetic plastics which makes their application wide. This review is focused on giving a background study on polyhydroxyalkanoate, with special considerations on their physicochemical properties, its applications, the pathways that leads to its synthesis and the various applications.

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OPEN ACCESS 042008

A Systematic Mapping Study of Utility-Driven Models and Mechanisms for Interclouds or Federations

Isaac Odun-Ayo, Victor Geteloma, Adesola Falade, Paul Oyom and Williams Toro-Abasi

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Cloud computing is a dynamic paradigm that applies utility driven models at all layers in providing elastic services to the users and also facilitating the processes of the cloud provider. Utility-driven models and mechanisms for cloud federation play a very significant role on the cloud, hence worth researching on. However, the issue of finding out a similar study in models and mechanics for Interclouds or federation is an arduous task for most researchers. Systematic mapping studies delivers an outline of all that had been completed in a specific discipline. The objective is to carry out a systematic mapping study of utility driven models and mechanics for Interclouds or federation. Selected results showed that articles on environment had more in relation to metric with 2.78%,

articles on design had more in terms of tool with 13.89%, articles on architecture had more in terms of model with 23.15%, articles on challenges had more in terms of method with 9.26%, and articles on policy had more in terms of tool with 6.48%. However, there were no articles on utility driven model and mechanisms for inter clouds or federation on the aspects of policy, architecture, design and challenges that consider metric. This study has identified research gaps in utility driven models and mechanics for Interclouds or federation which ought to inspire enthusiasm for further investigations by the scholars and industry experts.

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OPEN ACCESS 042009

Inhibition of Mild Steel Corrosion using Binary Mixture of Sesame and Castor Oil

Tomiwa I. Oguntade, Christiana S. Ita, Daniel T. Oyekunle, Tobi P. Oni, Temiloluwa Ojo and Isaac E. Ekere

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Mild steel is utilized as a prominent metal in the construction of equipment's such as pipes and storage tanks in the oil and gas industry. It is vulnerable to a high rate of corrosion attack which has led to great losses and damages in the industry. The effect of corrosion attack on mild steel have continued to create a global interest on a means of controlling it. Different research have reported different ways of preventing corrosion, one of which involves the application of inhibitors on these structures. Previous research works have demonstrate the use of corrosion inhibitors as an effective means of reducing corrosion rate. This research study was to explore the efficiency of the binary mixture of castor and sesame oil as an organic corrosion inhibitor at different concentration of brine, volume of binary inhibitor and time. Minitab 17 was used as an optimization tool for the experimental procedure. The highest corrosion rate of 42.20 mm/yr was observed at 0.7 M brine solution, 19 mL volume of the binary inhibitor, over a period of 21 days. The lowest corrosion rate (3.01 mm/yr) was observed at 0.7 M brine solution, 23 ml of binary inhibitor and at 13 days. The results shows that the binary mixture of both castor and sesame oil is an effective and efficient organic inhibitor used in controlling corrosion.

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OPEN ACCESS 042010

Severiy level of enuresis among children and adolscents in Ado-Odo, Ota, Ogun state, Nigeria.

V.D. Odususi and I. S. Afolabi

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Nocturnal enuresis habitually called bedwetting is said to be a highly prevalent health condition in children and adolescents but the impact of enuresis is often taken too lightly. Around the world today 15 % of children are affected. Enuresis is socially stigmatizing and can affect quality of life. Parents and families are equally frequently stressed about the condition. The knowledge of nocturnal enuresis and its severity will help to promote effective management. The aim of the study was to determine the severity of nocturnal enuresis among children and adolescents in Ota, Ogun state. The objectives are to assess frequency, history and parental perception about the condition. A crossectional community based study was conducted among 141 children in AdoOdo, Ota local government area within the age range of 6-18 years. Self-administered two-section questionnaire was designed to

assess demographic data, frequency of bedwetting, behavioral pattern, emotional stressor, parent's history, and previous attempt at treatment among others. The collected data was analysed using data tabulation (frequency distributions & percent distributions). The presence of enuresis among the children was 29 %. Enuresis was more in females (53.66 %) compared to males (46.34 %). There was a decrease in prevalence of enuresis with increasing age group (6-9 years was 52.4 %, 10-13 years was 33.3 % and 14-17 years was 14.3 %). History of nocturnal enuresis among parents and siblings was found to be 75.61 % and 57.10 % respectively. A higher percentage (90.24 %) of parents punishes their children for bedwetting. None of the mothers of the enuretic children had complication during pregnancy or at childbirth. Enuresis is a highly common childhood complaint. Genetics could be a leading factor for the occurrence nocturnal enuresis, but complication during pregnancy and childbirth is not. There is need to create awareness and educate parents and families about enuresis and the treatment options available.

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OPEN ACCESS 042011

Water contamination: Burden and stratagems for control.

E.C. Igibah, L. O. Agashua and A. A. Sadiq

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It is tough to explain the exact degree of the significance of water to man in his strenuous climb up of the civilization ladder. It is certain, conversely, that without water there would be no life of any form in the world and that, without water readily accessible in ample quantity and free of pathogenic creatures, man's advancement is enormously hindered. Though with no actual counting possibility, billions of man-days of labour are indubitably lost yearly because of sickness and death from water-borne diseases. Ill-advisedly, the regions which can least afford this economic damage are the dwellings where such illness and death are most proliferating. The obligation for decreasing this terrific waste falls on governments and, precisely, on health managements. It is the aim of this critique to assist the government executives who must meet this task among the health medicals officers, public health administrators and civil or sanitary engineers who engaged in public health, and sanitarians.

https://doi.org/10.1088/1742-6596/1378/4/042011

OPEN ACCESS 042012

Correlated respiratory indicators of Household waste burning practices in Lugbe – Abuja, Nigeria.

E.C. Igibah, L. O. Agashua and A. A. Sadiq

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The household waste burning practice and effects of the waste burning emission on respiratory health of the populace in the Lugbe, Abuja happens regularly, though not well recorded. The aim of the study was to quantify the waste burning occurrence as well as investigate the correlation between waste burning practice and respiratory problem in Northern Nigeria with Lugbe as case study since is an example of country side settlement growing to urbanites. Questionnaire was utilized to accumulate information from houses in Lugbe - Abuja. Total of 60 participants were enrolled and their responses on household waste burning besides respiratory symptoms were investigated. The

contributors stated that their neighbors burn waste habitually, with 43.5% and 32.4% of them from the central and rural zone respectively. The local waste authorities gathered garbage from 84.5% of these contributors once per week in the enlightened zone and central but rural is once monthly or not at all. The prevalent lower respiratory sign connected with waste burning was dehydrated cough (31.4%). For Lower and Upper health signs, the participants who participated in the practice of waste burning had a faintly higher prevalence of breath shortness (57%) and Water itchy eyes (49%) respectively. For each of lower and upper health signs, the trend is such that 6 months above is greater than immediately, which is greater than those of a month after. These results indicate that waste or bush burning impact on health is on the long – term basis.

https://doi.org/10.1088/1742-6596/1378/4/042012

OPEN ACCESS 042013

Impact of controlling wastes and sustainable improvement in Bwari – Abuja, Nigeria.

E.C. Igibah, L. O. Agashua and A. A. Sadiq

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The paper analysis waste management and sustainable improvement in Nigeria with specific reference to Bwari, F.C.T, Abuja. The area was divided into three regions namely: District A (south region), District B (west region) and District C (central region). Survey research stratagem was implemented with questionnaire as main tools applied for data gathering which were distributed to twenty-five families carefully picked randomly making total of 75 families that were studied. The main cause of waste management problem are illiteracy and income level, likewise city waste categorization for the Bwari - Abuja reveals paper, food leftovers and water sachets as the highest waste generated, but for transfer purposes, FLEXIBLE bag are regularly utilized to dispose waste since bags are stress-free in disposing and low-priced. The waste storing frequency is between 12 – 24 hours whereas waste throwing frequency follows frequently once and bi-weekly gatherings. Some respondents have open dumps within their vicinity where waste is stock before thrown away. However, there is great recycling event for metal and bottles since they are recycled at home and 15 % sell. Joint solid waste management practice in Bwari - Abuja are storing and highway or canal waste disposal whereas recycling and waste reduction which are waste minimization implements in the trio pyramid system which is the strength of most waste administration systems is faintly practiced.

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OPEN ACCESS 042014

Proportional studies of liquefied samples- Sewage, Hygienic and treated sewage water – case study of Gwagwalada, Abuja.

E.C. Igibah, L. O. Agashua and A. A. Sadiq

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This study is on comparative study of three liquefied (sewage, hygienic and treated sewage water) Gwagwalada, Abuja, Nigeria. Actuated sludge system was utilized as an example of the biological treatment technique, whereas wastewater from the estate septic cistern, actuated sludge treatment plant treated water from the ejection was acquired and physicochemical features of the mixing liquefied samples was carried out in the laboratory so as to ascertain the amount of Ammonia (NH3), calcium oxygen demand (COD), Sulphate (SO4), Biological Oxygen demand (BOD), Chlorine (Cl),

Total dissolved solid (TDS), temperature(T°C), Salinity and PH of the sewage, hygienic and the treated sewage water. Domestic wastewater treatment plant of five hundred cubic meters per day per capacity (500m3/day/cap) has efficient treatment proficiency and every parameter treated is within FME standard. This study will display the significance, viability of recovery and reprocess of organic waste in region with no comprehensive application besides, decreasing environmental impact, reused sewage effluent for drinking, cooking and agricultural purposes.

https://doi.org/10.1088/1742-6596/1378/4/042014

OPEN ACCESS 042015

Sustainability in Production and Selection of Reinforcement particles in Aluminium Alloy Metal Matrix Composites: A Review

Ndudim Henry Ononiwu, Esther T. Akinlabi and Chigbogu G. Ozoegwu

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This paper reviews relevant literature in the area of incorporating sustainable materials into the material selection process of metal matrix composites (MMCs) production. Agricultural and industrial waste materials used as reinforcements in MMCs have been reviewed to highlight the need for establishing a lean production process. The reviewed investigations have recorded improvements in both the microstructure, density and mechanical properties such as hardness, strength, tensile, and impact strength of the resulting MMC. The reviewed literature highlights stir casting as the most used method of producing aluminium and magnesium-based matrix composites due to its relatively low cost, simplicity, and efficiency. Based on the results of various studies, it is highly recommended that the use of these sustainable materials as reinforcements in MMCs possess the necessary properties to be used in engineering industrial applications.

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OPEN ACCESS 042016

Surface Energetics Effects on Mechanical Strength of Fibre Reinforced Polymer Matrix

J.E. Sinebe, J. L. Chukwuneke and S. N. Omenyi

− Hide abstract PDF

Surface energetics effects on the mechanical strength of fibre reinforced polymer matrix been studied employed the manual scraper mechanism in extracting fibre from plantain pseudo-stem and was treated with nine different treatments. Cylindrical shape mould was prepared for mechanical test samples with continuous and unidirectional aligned fibres. Two probe liquids; water and glycerol were used in contact angle measurement for all the treated and untreated samples. The contact angle data was used for the interfacial energetics computations using Neumann and Fowkes models and the mathematical analysis were carried out using Matlab software tools. van der Waals notion of particle-particle interaction was employed to explain the physiochemical properties such as the surface interfacial energies. The average value for the interfacial free energy of adhesion for fibre-water and fibre-glycerol are -10mJ/m^2 and -16MJ/m^2 respectively signifying attractive van der Waal forces. The tensile test results unveil that the average value for treated fibres is greater than the average value of 171.29N/mm^2 for untreated fibre except for potassium permanganate and phosphoric acid. These results reveal that an increase in tensile strength leads to an increase in the interfacial surface energy of adhesion. The treated fibres show a significant increase in interfacial surface energy and change in

free energy of adhesion which suggests a better bonding mechanism of interaction between the fibre and matrix except for phosphoric acid which reveals otherwise, it may be as a result of the chemical chopped off the fibre during the treatment. The average strain rate of about 0.003 per seconds, 0.002 per seconds and 0.005 per seconds were deduced from the treated Mercerization, Acetone and MEKP respectively which reveals the lower strain rate as compared to the untreated fibre of 0.008 per seconds. The negative strain rate for the potassium permanganate and phosphoric acid was found to be -0.002 and -0.001 respectively reveals that the treatments will debond faster than other treated fibres..

https://doi.org/10.1088/1742-6596/1378/4/042016

OPEN ACCESS 042017

Non-Linear Finite Element Approach to Aerodynamic Effects on Horizontal Taut Cable

J. O Nwabanne, J. L Chukwuneke and S. N Omenyi

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A horizontal taut cable which has application in a typical power transmission line was subjected to structural nonlinear static analysis. Finite Element Analysis (FEA) approach was employed in this study to ascertain the magnitude of tension on each node on the cable occasioned by induced aerodynamics forces. ANSYS 14.0 software helped in determining the behaviour of the system on the basis of finite element displacement method. Comparison was made between the two FEA cases with respect to the effectiveness of the analytical model which describes the response in form of a couple of degrees of freedom (DOF) while reflecting the complex features of the dynamics of the cable in reaction to the induced aerodynamic effect. In order to avert excessive displacement in the computations, it was necessary to incorporate the convergence procedure in the process. The optimum deflection of the parabolic response obtained from the analytical Finite Element Method (FEM) results in the absence of aerodynamic external effect was at the nodes 12 and 13 corresponding to cable weight of 1.002936N and cable tension of 189396.97kg/km. The cable also showed a maximum displacement of 4483.75mm for the X, Y and Z components at nodal point 2 while the minimum displacement value was 4218.75mm. The obtained result for this study revealed a complex modal behaviour as is quite expected.

https://doi.org/10.1088/1742-6596/1378/4/042017

OPEN ACCESS 042018

A processual model for the conceptualization of reliability concerns and it's validation among design stakeholders for sustainability

Daniel O. Aikhuele, Onyisi Ozuor and Ojo Sunday Isaac Fayomi

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The discourse addresses the different ways reliability information is communicated and shared to achieve sustainability at the early stage of product development, by conceptualizing the reliability communications process using a processual model. The model which is based on a mechanistic and a systemic view is used for analyzing the reliability information and concerns shared and communicated between and among design stakeholders. To prevent unauthorized persons from gaining access to the reliability information during the product design stage, an information filtering system is included in the model. The conceptualized processual model is a piece of a more extensive

undertaking that aims at assessing the sustainability of the different communication scheme among designers and product reliability teams located at different geographical sites provide a platform for rethinking the product reliability concerns and sharing. The model has been validated using an expert-opinion based method.

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OPEN ACCESS 042019

Extraction of oil from selected plants using Response Surface Methodology [RSM]

M.E. Ojewumi, D.T. Oyekunle, G.P Ekanem, O.R. Obanla and O.M. Owolabi

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This study involves the extraction of oil from three sources: orange peel, guava leaves, and *cassia fistula* leaves using Soxhlet apparatus. The variables considered in this study were time of extraction and sample weight. Minitab statistical software was used to randomize the runs. The combination of operating parameters that gave the optimum yield for the three sources were identified. The regression equation for each source was reported. The coefficient of determination (R^2) value for orange, guava leaves and *cassia fistula* extract were 99.51%, 99.90%, and 99.77% respectively. This shows that the model is a good prediction tool for extraction of oil from these sources. Based on the R^2 values guava leaves (99.90%) gave the highest prediction accuracy followed by *Cassia fistula* (99.90%), with orange leaves having the lowest R^2 value (99.77%) among the three sources considered.

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OPEN ACCESS 042020

The Effect of Evaporative Cooling System on the Storage of Citrus (Sweet Orange)

K.O Babaremu, T.A Adekanye, I.P Okokpujie, M.A Omodara and J Fayomi

− Hide abstract PDF

Postharvest losses have been a very perpetual challenge facing the agricultural industries as most produce get spoilt after harvest owing to poor postharvest handlings. Several attempts have been made to eliminate this challenge ranging from transportation, packaging and storage. The panacea to this problem is still much work in progress. However, a developed cooler with a cooling efficiency of 86.01% which was immensely able to salvage the rapid deterioration challenge of fruits as ascertained through a seven days concurrent storage of sweet oranges in a cooler and ambient. The result shows that the cooler successfully improved the shelf life of the stored produce with about 4% weight loss of the stored citrus compared to the 9% weight loss of the ambient storage.

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OPEN ACCESS 042021

Design and Construction of a Pedal-Power Grinding mill

Akande Stephen Oluwashola and Ayodele Mercy

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A pedal-power grinding mill has been designed and constructed. The machine is made of a chain drive mechanism. This mechanism is made up of sprocket, gear, pedal, chain, bearings, grinding disks, shaft and hopper for receiving the product to be milled. The pedal is used for generating torque for rotating the shaft and the grinding disk. This machine was designed as a low-cost solution for either no or inadequate electricity power supply from the electricity distribution company in the rural area and in some urban centers of Nigeria and other developing countries. The developed machine is economically viable and will reduce drudgery in using hand cranking for grinding agricultural product such as yam to produce yam flour, pepper, tomatoes, etc. The machine was observed to be effective in grinding tomatoes and can also be used for grinding other agricultural product.

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OPEN ACCESS 042022

The Role of Construction Materials in Building Collapse in Nigeria: A Review

G. O. Bamigboye, T. Michaels, A. N. Ede, B. U. Ngene, C. Nwanko and I. Davies

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Building failure or collapse happens both in the developed and developing countries but the rate of occurrence in the developing country such as Nigeria is quite alarming and therefore call concern. The menace of building collapse in Nigeria is very alarming and appalling. Building collapse in Nigeria has become the norms they are easily swept under the carpet whenever it occurs. It is rather unfortunate that both human and economic loss we record each time there is a failure or building collapse is rather humongous. There is also a lot of blame game among professional stakeholders in the industry once failure or collapse of building occur and unfortunately, there is no proper scientific investigation in most developing countries such as Nigeria to ascertain the cause of failure or collapse as the case may be in order to avoid any future occurrence. In the cause of this review, it was discovered that building materials such as reinforcing steel, cement, sand, granite, sandcrete blocks and concrete play huge important role in either the collapse or stability of buildings in Nigeria. The roles of these materials are so vital that they contribute immensely to the collapse of buildings. It was concluded that 10-25% of buildings that collapse in Nigeria are as a result of the use of poor quality building materials. The review has extensively dealt with building collapse in relation with the role of building materials during construction.

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OPEN ACCESS 042023

Achieving Energy Efficient Building through Energy Performance Analysis of Building Envelope in Student Housing

S. D. Olanrewaju, O. S. Adetunji and T. M. Ogundepo

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Protecting the built environment through reasonable incorporation of sustainable principles into the design of buildings is a vital role of architects and other built environment professionals. By so doing, the increase observed in energy demand of buildings constitutes a major challenge to the protection of and reduction of greenhouse gases produced by buildings. This constitutes a critical element in the movement towards a more sustainable future. This study examines the indispensable relevance of

carrying-out energy performance analysis on a building design blueprints prior to construction. The study employs the use of Autodesk Revit 2014 as a Building Information Modeling (BIM) tool and Autodesk Green Building Studio (GBS) for energy performance analysis of an existing student housing at Federal University of Technology Akure, Ondo state, Nigeria in order to recommend energy efficient strategies that could be implemented at the design phase of the student housing. The energy-saving effects of the different building envelope were investigated and results were analyzed. The annual energy use revealed approximately 60 percent of electricity consumed from the national grid with the left-over 40 percent expelled on fuel. This result was, however, based on an assumption of a 20 hours minimum daily power supply from the national grid. The monthly heating load chart shows that heat is lost from the walls of the building. The walling material has a considerable impact on energy consumption. The simulation results of the existing student housing were compared with eight alternative designs that alter the building envelope and incorporate shading devices to reduce the carbon footprint and energy use. The best alternative design runs reduced the energy consumed yearly from 402, 168 kWh/year to 385, 318kWh/year.

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OPEN ACCESS 042024

Experimental and empirical study of diesel and biodiesel produced from blend of fresh vegetable and waste vegetable oil on density, viscosity, sulphur content and acid value

Olusegun D. Samuel, Benjamin U. Oreko, Joel O. Oyejide, Stanley Idi and Ojo S. I. Fayomi

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Not quite long, researchers are motivated to explore the mixture of edible and inedible oils to improve fuel properties and reduce the cost of biodiesel production. Even though the tropics are renowned for abundant waste vegetable oil (WVO) generated from restaurant and food processing and frying shops, the fresh vegetable oil (FVO) seems to cause competition between food and fuel utilization if explored for biodiesel production. The current study attempted to derive one-dimensional models to determine key fuel characteristic of hybrid biodiesel-diesel fuel blends.Hybrid vegetable oil methyl ester (HVOME), which has been produced through alkaline transesterification was analyzed for important fuel properties and blended with diesel fuel (DF)) at 10, 20 and 40 on a volume basis. Standard methods as specified by (ASTM D6751) standards and the European standards (EN 14214) used. The effects of temperature and biodiesel content were investigated on viscosity were. Statistical regression technique was employed to derive one-dimensional models. The models were further adopted to correlate basic fuel properties with biodiesel blends. The kinematic viscosity, flash point and acid value increased while sulphur content decreased with increasing biodiesel fraction in HVOME-diesel blends. The kinematic viscosity of fuel blends decreased with the increasing temperature. The empirical models show high regression value (R^2) between properties and HOVME-DF blend. In conclusion, the results of this study can be adopted for thermophysical property collection for hybrid feedstocks' utilization and guide for regression modelling in biodiesel fuel industry.

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OPEN ACCESS 042025

Performance Evaluation of a Plate Encapsulated Salt Hydrate PCM Mixed with a Gel

N.E Sibande, D. M. Madyira, T. O. Babarinde and T Kumirai

An alternative method of cooling is required to meet cooling demands and simultaneously decrease conventional energy consumption. The current research aimed to investigate the feasibility of using a phase change material (PCM) in the form of a salt hydrate mixed with a CSIR-developed gel for PCM based cold storage that used nighttime cold to cool ambient air during the day. The experiments were conducted over a time period of three hours between 12:00 pm and 15:00 pm in the afternoon. The total temperature drops were found to be 3.8, 2.9 and 2.6 degrees for air flow rates of 0.03, 0.05 and 0.06kg/s respectively. The total energy transferred for each of the mass flow rates averaged 140.9, 144.4 and 158.9J for air flow rates of 0.03, 0.05 and 0.06kg/s respectively.

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OPEN ACCESS 042026

Development of a Statistical Model for the Effects of Air Blast Pressure, Melting Time and Fuel Consumed on Iron Melting Rate of an Erythrophleum Suave lens Charcoal-Fired Cupola Furnace

A. A. G Olorunnishola and S. A Anjorin

This work was designed to investigate the effects of air blast pressure, melting time and fuel consumed on iron melting rate of an *erythrophleum suaveolens* charcoal-fired cupola furnace. A regression model was formulated and the model validation established the existence of statistically significant relationships between the control variables and iron melting rate. By using the experimental data, R^2 value of 99.8 % was obtained, thus confirming that the model is fit since 99.8 % of the variation in melting rate could be explained by the control variables. The coefficients b_{0ec}, b_{1ec}, b_{2ec} and b_{3ec} are -434.656, 423.864, 1.188 and 1.858 respectively; and the output of the *t*- test showed that regression coefficients b_{1ec}, b_{2ec} and b_{3ec} were not equal to zero (table t-value=$t0.025, 11$ = 2.201), hence they are statistically significant. The regression model developed in this work as explained by the model analysis can estimate the melting rate as a function of the control variables and form a basis for developing a computer software which may help energy and foundry managers to significantly monitor and improve on the melting rate of cupola furnace.

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OPEN ACCESS 042027

A short review on solar concentrator for energy generation in tropical coastal belt

M.E Emetere, J.M Emetere and O.O Ometan

The use of solar photovoltaic (PV) panel in highly convective tropical regions along the coastal belt has been reported to have low efficiency. Hence, the lifespan of the PV panel is endangered by different solar spectral absorbed by the solar cells. In this research, the solar collector was reviewed with the aim of recommending designs for solar farm operator or standalone user. It is recommended that solar collector could improve the use of solar energy to about 34% in highly convective tropical regions along the coastal belt.

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OPEN ACCESS 042028

Modification to Metal Matrix Composites Nomenclature

P.O. Babalola, C.A. Bolu, A.O. Inegbenebor, O. Kilanko and S.O. Ongbali

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Naming Metal matrix composite (MMC) is very crucial to both the developer and the end users. It is an indication of what the developer put together which goes a long way in assisting the end user in selecting from myriad of available MMCs. The existing nomenclature put forward by Aluminium Association identified the matrix, reinforcement, percentage composition and the form of reinforcement but left out the particle size of the reinforcement. The particle sizes have been found to have significant effect on the properties of MMC and should be included in the adopted naming system. This paper revised the existing standard from 'Matrix/reinforcement/volume%form' to 'Matrix/reinforcement/volume%form/size in microns or nano'.

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OPEN ACCESS 042029

Microwave irradiation technique: Green potent energy source for sustainable applications

O. Ajani Olayinka and T. Iyaye King

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Synthesis of organic and inorganic compounds is a foundational concept in the preparation of bioactive material for drug development as well as provision of materials for other applications in everyday life of man. Conventional synthetic approach by heating under reflux has been in use since antiquity. This usually take a longer time to complete, it is not void of release of toxic chemical and could lead to decomposition of envisaged compounds some time. In recent time, microwave assisted reaction have been adopted in synthesis of numerous compounds which are essential templates in many industrial processes and various application. This present review deals with the recent advances of microwave irradiation techniques as sustainable and ecofriendly means of preparing compounds of interest to man. Microwave assisted technique approach is noted to be remarkably useful towards the synthesis of bioactive materials for drug design, polymeric materials for composite matrix, donor molecules for corrosion inhibition, material for battery application, nanomaterials as perovskites for supercapacitance electrodes, high wavelength compounds as solar cell sensitizers, dye materials in textile industries among others. Thus, microwave irradiation is an unavoidable technique for the accelerated eco-friendly synthesis of organic compounds which must be well explored for the benefit of man and his environment.

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OPEN ACCESS 042030

A Critical Analysis of Software Testing Tools

F. Okezie, I. Odun-Ayo and S. Bogle

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Software testing is a crucial part of software development, it ensures that the software been developed performs all functional requirements and is free from any form of defect and errors. This ensures that the software is of good quality and standard. While testing a software, it is important to be time and

cost consciousness. This reason has made most testers switch from the manual testing process to automation of software testing, to reduce time and cost. But then selecting a software testing tool for automated testing that best fit a project is important yet challenging task, the objective of this paper is to evaluate some of the most used software testing tool, identify their strength and weakness and also the field where they can be employed, either for mobile testing, web service testing or both. The method utilized in the paper involved the analysis of recommended literatures to pinpoint necessary testing tools selected based on inclusion and exclusion criteria, that were evaluated. The result of the analysis indicted that based on the selected criteria, testing tools that supports web platform testing made up 17%, while tools that supported desktop and mobile platforms was 10% and 7% respectively. also, 7% of the tools examined were found to be open source tools while 12% were licensed tools. 10% of the testing tools examined supported the test result and report generation criterion while tools that require the knowledge of programming language was least as only 3% of examined tools supported this criterion. It was observed that there is no one perfect tool for testing, but for a particular testing purpose, tradeoffs can be made to select the best tool depending on the size of the project, the budgeted cost for testing, the platform of the application and also the language that is used to develop the project.

https://doi.org/10.1088/1742-6596/1378/4/042030

OPEN ACCESS 042031

Improving career development through a Women mentoring program in the construction industry

AO Afolabi, FT Akinbo and A Akinola

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Due to the high underrepresentation of women in the construction industry, researchers are proposing innovative solutions to attract and retain female workers in the profession. The study examined the prospects of improving career development through women mentoring programs in the construction industry. Using an in-depth content analysis of literature, the study extracted barriers and impact of women mentoring programs. The study showed that in order to access the positive potential outcome for female students and workers there are barriers that must be surpassed. The barriers to an effective woman mentoring program identified in this study are both internal and external in nature. Once the barriers to women mentoring programs are not effectively suppressed it would lead to negative mentoring experiences. The study highlighted that in order for women mentoring programs to be effective both mentors and mentees should have gone through a mentoring training/workshop. This would help harness their individual characteristics, ability to set goals, ensure professionalism and the ability to give/receive feedback. The study identified potential outcomes of an effective women mentoring program in the construction industry.

https://doi.org/10.1088/1742-6596/1378/4/042031

OPEN ACCESS 042032

Vertical Architecture Construction: Prospects and Barriers in solving Lagos' Housing Deficit

AO Afolabi, FT Akinbo and A Akinola

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The population of Lagos State is projected to double by 2050 to 32.6 million people. This is estimated to be the 6th largest city in the world. However, the land mass area of the state remains relatively constant at 3, 577 Km2. There is need to identify sustainable housing solutions to reduce the level of homelessness within the megacity. Therefore, this study was aimed at examining the prospects and barriers in the use of vertical architecture construction in solving Lagos city's housing deficit. The study utilized content analysis of literature on the subject matter which were obtained from major online databases. The study identified the prospects in the use of vertical architecture construction such as reducing housing deficit, adequate land management, engender sustainable practices, improved innovation and proper planning within the state. Nevertheless, some barriers are encountered in the actualization of a comprehensive vertical architecture in Lagos megacity. The barriers include cultural bias to high rise, lack of technology, epileptic power supply, poor maintenance culture, poor fire service delivery, inadequate policies and investment funding. In conclusion, preparedness towards a sustainable housing solution of vertical architecture construction requires a public-private partnership approach in public housing delivery.

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OPEN ACCESS 042033

Experimental analysis of the performance characteristic of an eco-friendly HC600a as a retrofitting refrigerant in a thermal system

S.O. Banjo, B.O. Bolaji, I. Osagie, O.S.I. Fayomi, O.B. Fakehinde, P.S. Olayiwola, S.O. Oyedepo and N. E. Udoye

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The negative influence of refrigerants on the climate and the immediate environment in terms of their higher global warming potential (GWP) and ozone depletion potential (ODP) has prompted this study. Currently, natural refrigerants are the preferred alternative refrigerants and hydrocarbon is numbered among these natural refrigerants with zero ODP and negligible GWP. In order to improve and enhance the performance of the refrigeration system, the performance characteristics of the system were investigated experimentally using eco-friendly refrigerant HC600a as alternative to HFC134a. In addition, comparisons were made using refrigerant mass charge of 46 g of isobutane (HC600a) and 70 g of conventional refrigerant (HFC134a). Thermodynamic parametric analysis was conducted using electric power consumption, coefficient of performance (COP), cooling load and pull-down time (PDT) for the used mass charges. REFPROP software was applied to capture the thermodynamic properties of the vapour compression system (VCS). The results showed that the COP increased by 32.2 % when using 46g charge of hydrocarbon refrigerant with energy reduction of 4.5 %. Furthermore, the vapour compression system while using 46 g of isobutane (HC600a) attained an evaporating temperature of -21 °C in 60 minutes while 70 g of HFC134a attained the same temperature in 2 hours 15 minutes, which makes HC600a alternative refrigerant to run in the traditional refrigerator.

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OPEN ACCESS 042034

Development of artificial neural network for surface roughness and machine prediction

E.F Iriaye, D.E. Ighravwe, A.O Alade, S.A Afolalu and O.J Adelakun

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An ANN is a system triggered by the process of biological neurons with the aim of learning a certain system. This study focuses on development of ArtificialNeuralNetwork (ANN) model for surface roughness and machining prediction. It is easy, precise and based on linear relationship between the neural network output when all of the input parameters are constant at their mean values other than the input parameter which is given to crucial testing and target values of the network. This can be achieved by providing stimulus to the neuronal model, estimating the output, and regulating the weights until the preffered output is attained. The composition of artificial neural network present data where surface roughness (Ra) is taken as output parameter to produce ANN's response.Furthermore, selected sigmoid transfer function has its activation function in determining the actual value of a node in the ANNmodel ANN model.Right selection of machining parameter has been discovered to be a crucial in building a link between quality and productivity in an economic way.In conclusion, the neural network with the most favourable composition gives a productive approach to suggest an objective for surface roughness of the raw material under diverse cutting situations.The highest absolute percentage error in ANN model prediction was found to be 2.31% with average percentage error of 0.31%

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OPEN ACCESS 042035

Elucidation of phase equilibria in quinary system composed of lithium, sodium, and potassium cations along with sulfate and tetraborate anions at 0°C

Sherali Tursunbadalov

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The results of determination of phase equilibria in quinary system which is composed of lithium, sodium, and potassium cations along with sulfate and tetraborate anions at 0°C by translation method were discussed. Six invariant points, eighteen monovaraint curves, nineteen divariant fields and eight trivariant volumes were observed in this system. The total phase equilibria diagram of the system was fragmented into divariant cocrystallization fields of two solid phases and trivariant crystallization volumes of individual solid phases. The extracted crystallization volumes from total diagram reflect the structures of projected Janecke diagrams of the system saturated with the solid phases. The obtained results agree well with available experimental results and comprehensively clarify the reciprocal relations of phases in the system.

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OPEN ACCESS 042036

Electrochemical evaluation of the corrosion inhibition effect of calcium gluconate on mild steel in water based petrochemical drilling fluid

Roland T. Loto and Cleophas A Loto

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Application of biodegradable organic derivatives for corrosion inhibition of metallic alloys in water based petrochemical drilling fluid solution (WPDF) serves as a sustainable alternative to toxic chemical inhibiting compounds. The electrochemical corrosion inhibition of calcium gluconate (CG), on mild steel in WPDF was evaluated with potentiodynamic polarization and optical microscopy analysis. Statistical analysis on the effect of CG concentration on its inhibition

performance was done through One Way ANOVA. Results show CG performed effectively at all concentration studied with average inhibition efficiency above 85%. CG exhibited mixed type inhibition property. The polarization plots obtained showed CG induces passivation of MS from the lowest to highest concentration due to its film forming and adsorption characteristics. This observation was further confirmed from the steel morphologies where the inhibited steel was relatively smooth while the non-inhibited morphology was badly corroded with visible corrosion pits.

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OPEN ACCESS 042037

A sustainable ubiquitous engagement platform for open government Implementation.

R. N. Goddy-Worlu, C. K. Ayo and V. O. Geteloma

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Open government is known as a systematic procedure of government towards ensuring collaboration, transparency, innovation and participation to make government answerable to its citizens. It has been identified to have four stages of implementation with a given conceptual model known as the open government implementation model (OGIM). The first stage of the model is increasing data transparency, the second stage is improving open participation, the third stage is enhancing open collaboration and the fourth and final stage is realizing ubiquitous engagement. Each stage of this model provides its own deliverables from the first stage down to the last however, this paper focuses on the specific final stage of the model which is realizing ubiquitous engagement. In order to realize ubiquitous engagement, a platform for citizen engagement needs to be made available everywhere and at any time. The paper is aimed at proposing a sustainable engagement framework for open government as well as using the adopted framework for the design of an n-tier application architecture for citizen's engagement. The ubiquitous engagement platform is a mobile platform which provides a suitable avenue for active citizen participation in government policies and procedures. It is a one-stop application enabling government transparency and effective citizen communication. With the introduction of the platform, it bridges the communication gap between the citizens and government. Thereby enabling citizen's participation to enabled at available at any time and at anyplace via a reliable platform. The platform also enables government transparency and trust in government.

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Al-Si alloy for thermal storage applications-a review

I. E. Ogunrinola, A. O. Ndubuisi, P. O. Babalola, M. L. Akinyemi, A. P Aizebeokhai and A. Inegbenebor

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In regions that experience abundant sunshine, solar radiation emanating from the sun constantly generates significant thermal energy which has been an established potential source of harvestable clean energy. But an enormous amount of this form of renewable energy reaching the earth's crust gets re-emitted back into the space at sunset period without being harnessed. There is a special need for researches to further develop thermal storage alternatives with high thermal capacity, good thermal transfer rate, portable, cost effective and durable. From literature, aluminum and silicon

alloys have proved to be one of the most efficient thermal storage materials for medium to high temperature storage applications. It has been shown that different combinations of these gives different results depending on the application the alloy is to be used for. This paper reviews the application of Al-Si alloys for thermal storage with superior properties to Al-Cu, Al-Mg, Al-Cu-Zn, Al-Si-Mg and Al-Si-Cu alloys. The making of Al-Si for thermal storage through liquid and solid metallurgical processes were also highlighted.

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OPEN ACCESS 042039

A Proposed Unified Digital Id Framework for Access to Electronic Government Services

V. Geteloma, C. K. Ayo and R. N. Goddy-Wurlu

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The concept of identification has always been of great significance in terms of connecting an individual to his/her community. Verifying the identity of a person (card or number) is vital for granting the right and secure access to numerous services embedded within an Electronic Government (e-Government). e-Government applications typically require the need for citizens to provide a form of digital identity (card or number) for access to numerous services, as against the multiplicity of existing ones that are used for different platforms in Nigeria today. Nigeria and other developing nations have not taken the optimum advantage of utilizing an all in one digital identity card for providing citizens with an array of e-Government services, as well as proper authentication methods for security, as recorded in highly innovative nations in the world today. This paper addresses two major challenges of identity management in Nigeria, which are poor authentication methods for access to services and inadequate management of multiple identification systems. Therefore, the objective of this paper is to propose a web-based digital identity system framework for accessing multiple e-Government services, which includes Electronic Voting, driver's licence, Electronic Passport, Electronic Health and Electronic Payment. Also included in the framework is the authentication services, which utilizes Near Field Communication (NFC) smart cards, biometric data, and One Time Password (OTP) as a consistent and reliable means of identifying and authenticating the user's access to the embedded e-Government services.

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OPEN ACCESS 042040

Analysis of the Influence of Laser Parameters on the Microstructure and Surface Properties of Laser Deposited Aluminum Based Coatings

O.S. Fatoba, E. T. Akinlabi and S. A. Akinlabi

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The effects of processing parameters were investigated namely laser intensity and speed of laser scanning of Laser Metal Deposition (LMD) process had on the microstructure, metallurgical evolution, porosity generated in the coating, the geometrical property of the coating and the sizes of the grains in the coating. The processing parameters were applied in combinations in order to find the optimized settings of the process that least affects the metallurgical properties of the Ti-6Al-4V alloy substrate cladded with reinforced aluminium based powder. The temperature gradient and the rate of solidification of reinforcing the Ti-6Al-4V substrate with the aluminium based power were

also focused on in terms of how they were influenced by the laser intensity and the scanning speed used in the building process. The inherent material properties were dependent on the process input parameters. The characterized performances considered in the investigation was influenced significantly by the laser processing intensity. The results of the investigation showed that the density had increased in proportion to the increase of the processing laser power coupled with the reduction of the speed of the laser scan. Moreover, for a laser power equivalent to and exceeding 950 W, the density became less susceptible to the laser power. The increased temperature field led to changes in geometry of the coatings as a results of more absorbed laser energy. The materials properties were influenced by the Fe-intermetallic compounds. The molten pool had columnar grains which were fully developed, along its volume as determined in the examination of the microstructure. In the direction of processing, the sample processed at 1.0-1.2 m/min had a reduction in width of the coatings from 1.643 to 1.293 mm and along the height it reduced to 0.375 at 2% Fe and 1% Mn. Increase in the percentage of both Fe and Mn increased the width of the coating to 1.833 mm at 1.0 m/min while the height continued to reduce to minimum of 0.272 mm at 1.2 m/min respectively.

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OPEN ACCESS 042041

The Impact of Zn and Cu Reinforcements on Microstructural Enhancement and Performance of Laser Cladded Ti-Zn-Cu/Ti-6Al-4V Composite Coatings.

O.S. Fatoba, S. A. Akinlabi, E. T. Akinlabi and F. M. Mwema

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The effects of zinc and copper reinforcements on Titanium alloy via Direct Laser Metal Deposition (DLMD) process was investigated. Process parameters had great influence on the microstructure, metallurgical evolution, tensile and yield strengths performance. The process parameters had a significant influence on these factors considered, including the morphology of the surface, density, hardness, evolution of the microstructure, accuracy of the fabricated coatings dimensions and the mechanical performance of the Titanium alloy components processed by DLMD. The results of the investigation showed that the hardness had increased in proportion to the increase of the processing laser power coupled with the increase velocity of the laser scan. Moreover, for a laser power equivalent to and exceeding 1000 W, the hardness became less susceptible to the laser power. Morphological observations along the side of the surface showed the prominence of the adhesive powder, flow path of the melt pool and the areas which overlapped, attributed to the increase of the laser scanning speed. When the laser scanning speed was increased it attributed to the grain width reduction of the prior beta and a transformation in shape of the martensitic primary alpha into fine needle-like structures. In terms of the yield and tensile performance, the results revealed that increasing the scan velocity was favourable to the property, showing that the mechanical performance became better at higher scanning speeds. At the set laser intensity of 1000 W and a 1.0 m/min laser scanning speed, the fabricated coatings enhanced with 48.03 % hardness, 47.42 % tensile strength and 29.81% yield strength.

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OPEN ACCESS 042042

Analysis of Weather Data for Humidity Control for Paper Storage and Printing Press in Abuja, Nigeria

O. O. Awolola and J. A. Olorunmaiye

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One of the challenges of printing and paper industries is the issue of inappropriate humidity in the environment where the paper mills and printing shops or stores are located. Humidity of the environment is a factor of great concern for storage of papers and when printing. This work considers the needed optimum relative humidity that is required for high quality printing and analysis of a fifteen-year weather data of hourly dry bulb temperature (TDB) and relative humidity (RH) for Abuja in the Federal Capital Territory of Nigeria, obtained from the Nigerian Meteorological Agency (NiMet). A bin width of 1°C and 5% were used for TDB and RH respectively. The two-dimensional dry bulb temperature and relative humidity bin data were obtained for each month of the year. High relative humidity which is inimical to high quality printing production, occurs in many months of the year, especially June through October, hence dehumidification process would be desirable during such periods. The optimum relative humidity for quality printing of between 45%-55% occurred for about 1027.9 hours out of the 8766 hours in the year. Therefore, it can be concluded that dehumidification to the right humidity level is necessary most of the time in Abuja for good quality printing work.

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OPEN ACCESS 042043

Surface Modification and Wear Resistance of Electroless Ni-P Based Duplex Alloy Coating

O.R. Oloyede, A.S Afolalu, O.J. Adelakun, O.R. Adetunji, A.O. Adeodu, K. Bello, T. M Azeez and K.E. Andem

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Ni-P-W multi-layered alloy coating was electrolessly deposited on 10 x 15 x 1.5 mm mild steel capons. The coated samples were heat treated between 200 – 800 °C and the resultant effect of the annealing on the small scale structure and mechanical properties of coating was studied by using X-ray diffraction, Scanning electron microscopy, nano-indenter, pin-on disc wear tester and interferometry Spectroscopy. The result shows that the as-deposited amorphous duplex coatings crystallise in steps as the annealing temperature increases and this gives raise to new phase formation in the mechanical properties of the coating. The study reveals the impact of high temperature annealing on the microstructure, morphology and microhardness of this duplex coating within certain temperature range; which was attributed to the formation of new Ni_3P and Ni-W phases, its grain refinement and consequently, better linear microhardness and wear resistance relationship within given temperatures.

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OPEN ACCESS 042044

Biopolymer Synthesis and Detection by Soil Bacteria and Yeast

C. F. Nnaji, S. A. Balogun and O. B. Akpor

− Hide abstract PDF

Biopolymers have emerged as potential alternatives to synthetic plastics over the last decades because they share very similar characteristics, are biodegradable and thus can reduce the global pollution caused by synthetic plastics. The primary focus of this work was to explore PHB synthesizing ability

of indigenous soil bacteria and yeast during a single-phase growth condition. Three bacterial (two soil isolates and *Bacillus subtilis*) and one yeast species were used for the study. PHB synthesis study was carried out under batch experimental setup at incubation temperatures of 25 and 37°C. Evidence of PHB synthesis were confirmed by Sudan Black B staining for bacterial and yeast cells isolates. The highest PHB granules recovered was estimated to be 87 mg/100ml at an optimal temperature of 37°C, with none of the test microbial species showing PHB production at 25°C. Generally, the test isolates showed distinct strategies of PHB accumulation at different incubation periods; some throughout the growth period and others only when growth is at the stationary stage. In the majority of the isolates, growth rate of the test isolates was however directly proportional to the quantity of PHB produced. The PHB synthesizing potential of the test microbial species could be optimized by growing mixed cultures of both exponential and stationary PHB synthesizing organisms in a single fermentation process step, where PHB production is guaranteed to occur throughout the incubation process. This optimization strategy along with its ideal process conditions can lend to the sustainability of this technology.

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OPEN ACCESS 042045

Review and Analysis of Mechanical Properties of Friction Stir Welds of High Strength Aluminium Alloys

Olatunji P Abolusoro and Esther T Akinlabi

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There have been significant advancements of recent in the studies of friction stir welding of high strength Aluminium alloys. These studies cover developments in the welded joint properties of these alloys. This paper reviews some available literature on evolving mechanical properties of friction stir welding of high strength aluminium alloys especially those of 7075 aluminium alloy which happens to be the most versatile member of the high strength aluminium alloy group. This review is aimed at establishing a correlation between the tensile behavior, plate thickness and temper conditions of the 7075 alloy when joined by friction stir welding (FSW) in both similar and dissimilar joints with other metals. The average values of reported ultimate tensile strength, yield strength, and percentage elongation have been calculated and presented. Comparative analysis was made between the tensile properties at different temper designation and plate thickness. The analysis revealed that temper conditions significantly affect the mechanical properties of both the similar and the dissimilar joints and that similar welding at T6 and T651 temper conditions gave higher weld efficiencies than dissimilar welding with other groups in the aluminium series. However plate thickness have little or no influence on the ultimate tensile behaviour, yield strength and elongation of the welds. The review also indicates that there is a range of temperature between which post weld heat treatment (PWHT) could be performed in order to obtain maximum tensile property This paper is a significant approach to enhance high performance joining techniques and the reliability or otherwise of friction stir welding technology to join 7075 aluminium alloys under different heat treatment or temper conditions of the alloys for better industrial applications.

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Effect of Kenaf Core Fibre (*Hibiscus cannabinus*) as one of the Dispersing Phases in Brake Pad Composite Production

B.U. Anyanwu, G.O. Olayinka, D.T. Ezeokeke, O.S. Fayomi and O.O. Oluwole

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Brakes are essential parts of all means of transportation. Their function is to slow or stop a vehicle by friction. Asbestos has been widely used in the production of brake pads. However, its application poses adverse effects on human health and the environment. The aim of this study was to determine the effect of kenaf core fibers as one of the dispersing phases in brake pad composite production. The materials and methods employed in the study, followed procedures in established standards and literatures. The materials were grounded into fine powder and sieved into grade sizes of 100 μm and 200 μm. They were weighed on a digital scale according to a specified composition and mixed thoroughly for about five (5) minutes to obtain homogeneity of the mixture. Afterwards, the mixed compositions were placed inside a 5 cm × 3 cm × 2 cm cylindrical mould. These mixtures were then compacted on a hydraulic press and allowed to dry at an ambient temperature of 37°C. A series of physio-mechanical tests such as porosity, ash content, density, compressive strength, hardness and wear rate were conducted on the developed brake pad samples as well as the control samples. The results showed that the average values for porosity, ash content and density of the developed samples enhanced with kenaf core fibres were 0.813%, 57.25% and 1.389 kg/m^3 respectively. These values compare well with that of the control samples. Also, the hardness, wear rate and compressive strength of the samples enhanced with kenaf fibers gave average values of 121.25 BHN, 10.121×10^{-2} g/km and 105.75 MPa respectively. These values also compare well with that of the control samples. From the results gotten and all the properties determined, the study showed that kenaf core fibres has good potentials as dispersing phases for brake pad composite production.

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OPEN ACCESS 042047

Eco-friendly Inhibitors for Corrosion Protection of Stainless steel: An Overview

Omotayo Sanni, Ojo Sunday Isaac Fayomi and Abimbola Patricia Idowu Popoola

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Corrosion is a major concern in the industrial application of ferrous alloys, this is as a result of the enormous cost involved in damages, maintenance and corrosion control. Stainless steels have high corrosion resistance capacity because of the existence of chromium, which forms a passive film layer of chromium-rich oxide in the presence of oxygen at lower temperatures; this forms a barrier against the surrounding. However, this layer could be damaged in aggressive environments. This necessitates attention from researchers worldwide for novel, cost effective, and environmental friendly corrosion prevention techniques. Inhibitors are extensively applied in the industry to minimize the corrosion degradation of metallic alloys; however, most inhibitors are hazardous and expensive. These toxic effects have led to the use of natural products as anticorrosion agents which are eco-friendly and harmless. This review briefly discusses some of the eco-friendly substances which are used as corrosion inhibitors for stainless steel in aggressive media.

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OPEN ACCESS 042048

Experimental Study of Corncob and Cow horn AA6063 Reinforced Composite for Improved Electrical Conductivity

K.O Babaremu and O.O Joseph

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Composites are beginning to gain more relevance in numerous areas of engineering applications because of their improved mechanical, physical and electrical properties compared to the parent and indigenous materials. In this study, aluminium matrix composite was developed using aluminium AA6063 as the base material and reinforcement with granulated cow horn and corn cob as organic compounds, in varying percentages of matrix mixture. The particulates, CC, CH and CC-CH were added to the composite in various percentages of 5%, 10%, 15% and 20%. The composite was developed through a stir cast process and further fabricated into a 30mm diameter and 3mm thickness samples. The samples were tested for electrical conductivity and the result showed that the conductivity level of the materials increased to 4.845 x 10^2S/m compared to the initial conductivity value of 2.947 x 10^2S/m for the as received aluminium sample.

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OPEN ACCESS 042049

Corrosion Performance and Surface Analyses of Laser Cladded Zn-Ni-Fe Coatings on ASTM A29 Steel.

E. T. Akinlabi, O.S. Fatoba, S. A. Akinlabi and F. M. Mwema

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The corrosion behaviour of the laser coatings was investigated in 3.65 % sodium chloride solutions at 30°C via potentiodynamic polarization technique. The composition of Zn-50Ni-5Fe at parameters 900 W and 1.2 m/min exhibited enhanced electrochemical performance in 3.65wt.% NaCl solution. Microstructures with unique characteristics and refinement of grain size were observed. The fast solidification of the coating is accounted for this unique features. In terms of corrosion performance, results revealed that increasing the laser scanning speed was beneficial to the property, showing that the corrosion performance became better at higher scanning speeds. At the set laser intensity of 900 W and increased laser velocity, Zn-50Ni-5Fe coatings showed enhanced microstructure. The multiple tracks applied in the direct laser metal deposition (DLMD) process had resulting fields of residual stresses which attributed to the solid-state phase transformation that was a repeated process. The study validated the reliability of optimizing DMLD set parameters for metallurgical and mechanical considerations. These bring improvements in coatings which were laser cladded in terms of their corrosion performance and the dimensional accuracy, by optimizing the processing parameters. The only processing parameters which were varied was the laser intensity and the scanning speed, which were employed to numerically design the DLMD experiment. An empirical method was also developed and was used to validate the results achieved experimentally. The Grey relational model (GRM) used in this research described vividly the influence of optimized factors on the improved corrosion resistance and compared reasonably with the experimental results. In addition, the proposed model has the potential to provide induced corrosion rate predictions of coatings fabrication that are additively manufactured.

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OPEN ACCESS

Suppression Of Natural Convection And Radiation Heat Losses In Solar Cavity Receivers: A Novel Approach

042050

T. Bello-Ochende

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The concentrating solar power technology has great potential to be used for energy production and it is a promising alternative to conventional fossil fuel-based energy technologies, such as coal power plants, due to the abundance of solar energy as an energy resource, as well as its minimal impact on the environment. The parabolic dish receiver assembly is one such promising concentrating solar power technology. It usually consists of a reflector in the form of a dish with a downward-facing receiver at the focus of the dish. A cavity receiver is used to maximise the absorption of the concentrated flux. However, the receiver is subjected to environmental variations, as well as changes in receiver inclination angle, which lead to heat losses that affect the overall receiver's performance. The need for the commercialisation of economically viable parabolic dish systems necessitates further in-depth investigation into cavity receiver designs. As the cavity receiver plays a critical role in transferring solar heat to the engine, any heat loss from the cavity receiver can significantly reduce the efficiency and, consequently, the system's cost effectiveness. It is therefore essential to assess and effectively minimise heat loss in the cavity receiver to improve the thermal performance of the system, which can contribute to the commercialisation of this type of technology. This novel approach of suppressing natural convection heat loss in a cavity receiver was investigated. The proposed model has not been observed in literature. A cavity receiver with plate fins attached to the inner aperture surface was investigated as a possible low-cost means of suppressing natural convection heat loss in a cavity receiver. Employing air as the working fluid, laminar natural convection heat transfer from the cavity receiver with plate fins attached to the inner aperture surface was investigated for a range of Rayleigh numbers, inclination angles, and fin heights and thicknesses

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042051

Evaluation of Corrosive Behavior of Zinc Composite Coating on Mild Steel for Marine Applications

O. P Abioye, A. J Musa, C. A Loto, O. S. I Fayomi and G. P Gaiya

− Hide abstract PDF

Mild Steel has various forms in which it can be used. It possesses mechanical properties and hence it has found various implementations in many sectors / industries. However, the downside of using mild steel is that it has a high susceptibility to corrosion. There are numerous techniques for protection of mild steel but Zinc electrodeposition techniques is the most preferred method for producing a suitable film coating for the appropriate protection of mild steel. The effect of deposition potential, current, bath composition (including temperature), deposition time and concentration on the structure and crystallinity of the films deposited was systematically studied from various literatures. Introducing zinc into the coating process significantly alters and improves the mechanical and chemical characteristics of mild steel.

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042052

A Review on Some Effects of the Electrolytic Deposited Zinc Oxide Multilayered Composite Coatings on Mild Steel

O. P Abioye, G. P Gaiya, O. S. I Fayomi, C. A Loto and A. J Musa

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Corrosion is a major problem in engineering because of its adverse effects involving the deterioration of materials as well as the destruction of such materials. Corrosion of mild steel causes excessive damage in terms of material loss and reduced efficiency. This imposes attention from researchers worldwide for novel literature review. This study presents a review on the effects that zinc oxide multilayered composite coatings have on the mechanical properties of mild steels. These mechanical properties include hardness, corrosion resistance, wear resistance, impact strength, tensile strength, and flexural strength. It was reported by various researchers that coating with multilayered composite of zinc oxide gave a better result as compared to coating with Zinc alone. From the literature studied, it was noticed that more work is still required to identify and use more natural products as constituents of these multilayered composite.

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OPEN ACCESS 042053

Distribution of Antibiotic Residues in Non-medicated Poultry Feeds by High-Performance Liquid Chromatography with Diode-array Detection

A.O. Oyedeji, T.A.M. Msagati, A.B. Williams and N.U. Benson

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This paper reports on the determination and distribution of antibiotic drugs in poultry feeds mainly the layers and growers mash obtained from Ogun state in Nigeria. Pulverized feed samples were initially treated with phosphate buffer adjusted to pH 7 and the analytes extracted in an SPE cartridge with ammonium hydroxide and methanol. The extract reconstituted in phosphate buffer was determined with high-performance liquid chromatography-diode array detection (HPLC–DAD). The analytical column was an XTerra MS C18 column, (4.6 mm x 100 mm, 3.5 μm) with mobile phases consisting of ultrapure water and acetonitrile mixed with 0.1% HCOOH in gradient elution mode. Data acquisition was achieved with AgilentChemStation Version B.040.01 SP1 while the analytes were completely separated under 10 minutes with good resolution and symmetric peaks. The high correlation coefficient (R^2) values (> 0.998, excluding sulfadimethoxine) indicate a good correlation between analyte concentration and peak areas. Limit of detection (LOD) and quantitation (LOQ) was between 5.37 and 55.42 ng/g, and 17.91 and 184.74 ng/g, respectively. All the drugs exhibited high mean concentration values in the two feed types, and there was no significant difference between their means ($p < 0.05$). The results clearly showed that feed millers fortify their feeds with antibiotics mainly sulfonamides in varying amounts without declaring same, thus compromising security of poultry birds and human consumers.

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OPEN ACCESS 042054

Silicon Nitride-based Ceramic Material as a Reinforcement with Corrosion Resistance Properties in High Grade Aluminium (AA8011) Metal Matrix Composites

J. Fayomi, A.P.I. Popoola, O.M. Popoola and O.S.I. Fayomi

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The impact of silicon nitride particulates as a ceramic reinforcement material on the corrosion mitigation of AA8011 in 0.5 M H_2SO_4 was Experimented with potentiodynamic polarization technique, and the microstructural evolution was keenly observed with TESCAN scanning electron microscope (SEM). The findings from the research show the enhancement in the corrosion performance of the developed composites in relation with the unreinforced AA8011 alloy. The corrosion rate was observed to decrease drastically at higher percentage reinforcement of 20% Si_3N_4 with 66.78% efficiency. The scanning electron micrographs present a pitting form of corrosion, the pit was seen to be more pronounced in the unreinforced alloy than the developed composites.

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OPEN ACCESS 042055

Investigating the Microstructural Evolution and Characterization of Additive Manufactured Zn-Sn-Ti/Ti-6Al-4V Composite.

O.S. Fatoba, S. A. Akinlabi, E. T. Akinlabi and L. C. Naidoo

− Hide abstract PDF

The investigation focused on studying how the reinforcement powders and titanium alloy substrate were influenced by the volumetric energy which was absorbed. The only processing parameters which were varied was the laser intensity and the scanning speed, which were employed to design the direct laser metal deposition (DLMD) single- and multi-tracks. Laser surface modification techniques has unique benefits and properties compared to other conventional techniques. These techniques have process factors that affect directly the microstructure of materials which in turn influence the materials properties. The results revealed dense microstructure in the fabricated coatings in terms of the microstructural evolution, the sizes of the different grains, the structure of the phases formed and the orientation. The modified surface layer of the additively manufactured coating had improved and had a fine microstructure. Optimizing the DLMD processing conditions resulted in a crack-free surface layer but still promoted a few population of gas defects. The micro-hardness measured in the 5Zn-10Sn-Ti coating at 900 W and scan speed of 1.0 m/min was approximated to be 637 HV at all processing conditions employed, and with respect to the hardness of the substrate, there was a 51.33% increase from 310 HV. But increase of 57.2% was noted at 900 W, 1.0 m/min for 5Zn-10Sn-Ti coating. There was enhancement in the results of the micro-hardness tests conducted and this was due to the resulting microstructural evolution. Homogeneous and dense microstructures was accountable for the micro-hardness performance measured.

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OPEN ACCESS 042056

Investigation of Household Refrigerator System with Varied Capillary Tube Length

D. M. Madyira, G.T. Marangwanda, F.M. Ekundayo, T. O. Babarinde and S.A. Akinlabi

− Hide abstract PDF

In this paper, the performance of R600a was investigated in a household refrigerator originally designed to work with R134a using varied capillary tube length (1.0, 1.15, 1.30 and 1.45 m). The refrigerator was instrumented with four thermocouples at the inlet and outlet of the major components. Also, two pressure gauges were connected to the compressor to measure the suction and

discharge of the compressor. The experimental results were used to evaluate the performance of the system. The results showed that at optimal capillary tube length the COP and cooling capacity of R600a in the system increased with 45% and 4.2% respectively and the power consumption reduced with 25% using 1.30 m varied capillary tube length compared to R134a. Conclusively, R600a can serve as a retrofit in the household refrigerator systems originally designed to work with R134a refrigerant.

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OPEN ACCESS 042057

Fuels and Chemicals from lignocelluloses: A Short Overview

Augustine O. Ayeni, Francis B. Elehinafe, Olayile Ejekwu, Michael O. Daramola and Oluranti Agboola

This paper looked at the potential and available alternative conversion paths for fuels and chemicals production away from the conventional conversion processes of fossil based fuels. Lignocellulosic biomasses are abundant, renewable, and domestically available energy resources. Though with its own attendant challenges, there are achievements and prospects that have been made in developing environmentally friendly processes for small and large scale conversion of lignocelluloses to different fuels and chemicals. With the continuous reliance on fossil fuels, there is the ever increasing climate change caused by the increasing greenhouse gas emissions such as carbon dioxide. Biomass from marine, trees, plants, animal wastes, food and non- food crops, grains, and wood based can produce fuels such as ethanol, butanol, and other chemicals through some promising technologies. Therefore, identifying ways to improving production efficiency of fuels and chemicals during biomass conversion processes to a sustainable level is very crucial.

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OPEN ACCESS 042058

Characterization of Medical Wastes from selected Hospitals in Umuahia, Nigeria

E. I. Ugwu, A.C. Ekeleme, S. T. A. Okolie, O. P. Ibe, C. F. Chieke, H. O. Ibearugbulem, M. Omeje, A N Ede, P.O Awoyera and E.C. Ugwu

Medical wastes are classified as special types of wastes owing to their non-biodegradability. Inadequate medical waste management has been identified as a problem that needs urgent attention in developing countries, especially Nigeria. This study was aimed at estimating the status of medical waste management in Umuahia, southeast Nigeria and making recommendations, which will go a long way in curbing the menace of environmental pollution. The medical facilities studied include Government hospitals, private hospitals and primary health centres/maternity; categories A, B, C respectively. A descriptive study was carried out between February to July 2016, and it involved the use of personal interviews, on-site investigations as well as questionnaires, which were administered to health workers as respondents using multistage sampling. Inventory of medical wastes was taken daily, and the data analysis was carried out with the aid of statistical package for social sciences (SPSS). Results showed that the total quantity of medical wastes generated was found to be 59.811 kg/ward/day, 32.53 kg / ward/day and 31.53 kg/ward/day for categories A, B and C medical facilities respectively. Results also showed that category C lack training on handling while 75% and 50% of A

and B respectively conducted training on handling waste. The percentage of adequate knowledge of waste segregation obtained from category A, B and C are 85.7%, 33.3% and 0% respectively. The findings further showed that 57.1% and 28.6% of large and medium hospitals respectively use colour-code for disposal while small hospitals do not. The results obtained indicated low compliance with medical waste management standards. Thus, recommendations are made for pre-service training of health professionals as well as waste handlers, in order to ensure adequate compliance with environmental laws and policies.

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OPEN ACCESS 042059

Determination of a sustainable concrete floor and ramp for automotive lube bay shed in Nigeria

Olutola Fakehinde, Onyisi Ozuor, Oyeleye Bamidele, Adeoye Oluyori, Amoo Ibrahim, Daniel Aikhuele and Ojo Sunday Isaac Fayomi

Structural construction of concrete floors and ramps by unskillful personnel that allows undesirable substances that affect the quality of concrete, inappropriate concrete mix that determines the right blend for compressive strength, workability, durability, and chemical resistance have been identified as the reason for collapse of structures. The results show that most failures can be attributed to poor design and workmanship that could have been avoided by careful attention to the factors that makes a quality installation. This project is out to select concrete grade based on functional strength specification and material availability, not only on mix ratio, and in tandem with the technological manufacture or repair of automobiles, and for practical experience. The selection of functional concrete grade results to better mass concreting, compaction, curing and process optimization.

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OPEN ACCESS 042060

Review of Atomic Layer Deposition of Nanostructured Solar Cells 4

O.K. Ukoba and T-C. Jen

This study reviews atomic layer deposition technique with a special interest on solar cells applications. Atomic layer deposition is a vapour phase deposition technique used for producing thin films for several applications. This review focuses on the chemistry of Atomic Layer Deposition of solar cells, merits and demerits of ALD on thin film solar cells. Solar cells have attracted a lot of interest due to their potential for affordable, clean and sustainable energy. Solar cells can be deposited using different deposition techniques but Atomic layer deposition currently attracts attention owing to the merits. ALD has functional merit to bulk materials, great processing flexibility and affordability. The review examined the merits of ALD and solar cells and areas for future study. It offers affordability, ease of control of film growth, conformal and improvement on the deposition of solar cells. Despite few demerits, ALD is poised to be the deposition technique of choice for modifying interfaces of the film for improved performance.

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OPEN ACCESS 042061

The use of rice husk ash as admixture in producing self-compacting concrete

Adeoye Olowofoyeku, Olatokunbo Ofuyatan and Ajao Adekunle

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Admixtures are incorporated into concrete in today's world in order to achieve variety of goals. This research study the use of rice husk ash as an admixture in producing self-compacting concrete. The rice husk ash is varied in different percentages (5, 10, 15, 20, 25 and 30%) as partial replacement for ordinary Portland cement (OPC) to know if it improves the properties of fresh and hardened properties of the self-compacting concrete. The superplasticizer used was conplast SP 430 and the water cement ratio 0.35 was kept constant throughout all mix. Rice husk ash is a good super-pozzolan which is used to make special concrete mixes, in which the slump Flow, T50cm slump, V-funnel and the L-box test was used to test for the workability of the fresh concrete mix and the compressive strength of each mix was tested to know the specific strength of each self-compacting mix with varying percentage of rice husk ash at 7, 14 and 28 days of curing.

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OPEN ACCESS 042062

Wastage amidst shortage: Strategies for the mitigation of standby electricity in residential sector in Nigeria

Obafemi O. Olatunji, Stephen A. Akinlabi, N. Madushele, Paul A. Adedeji, Felix Ishola and Olayinka O. Ayo

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Due to rising population and the increasing rate of urbanization, residential electricity usage accounts for a large chunk of Nigeria's electricity consumption. However, little attention is paid to electricity conservation in the country. In response to this, several studies are been tailored to ensure a rapid reduction in energy consumption through various alternatives including energy efficient technologies given the current state of inadequate electricity supply in the country. On this note, this article discusses the significance of standby electricity in Nigeria. The electricity generation and consumption patterns were briefly discussed while the current electricity saving behaviour and practices among the urban dwellers were detailed with a case study analysed. Based on the case study, it was discovered that the mean standby load across the 30 households were estimated at 60 W ranging from 34-144 W. Also, standby consumption accounts for 13-44% of the annual electricity consumption across the households. Finally, the strategies for electricity saving and sustainable consumption, most especially the mitigation of standby electricity were highlighted.

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OPEN ACCESS 042063

Techno-Economic Study of Final Year Projects: A Case Study of Mechanical Engineering Department in one of The Top Universities in Africa

C. A Bolu, E. E Bassey, A. A Abioye and J Azeta

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The Africa Union Agenda and United Nation Sustainable Development Goals array a focal scope on various issues for the flourishing of the planet and all life therein. These aspirations and goals mirror the ambitions of Africans for flourishing and prosperity, for a continent of free nationals and

extended horizons, for solidarity and integration coupled with freedom from conflict and enhanced human security. Although the timeline for achievement of these goals and aspirations grows shorter; there have been reports that the undergraduates' final year projects in most of Africa's universities are not proffering relevant solutions to different national problems. This paper studies completed final year projects of undergraduates in the Department of Mechanical Engineering in one of the top-rated universities in Africa, over the period of seven sessions. The projects over these periods were classified using some parameters such as United Nation Development Agenda, Africa Union Agenda and Scopus Classification System for projects. A database of the classified projects was designed and developed; which was subsequently analyzed utilising the Statistical Analysis Software to determine different prescribed parameters. Based on the results, the field of Corrosion in the Department had the highest number of projects during this period.

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OPEN ACCESS 042064

Review of the Development of Biodegradable Plastic from Synthetic Polymers and Selected Synthesized Nanoparticle Starches

A. A Abioye, O. O Fasanmi, D. O Rotimi, O. P Abioye, C. C Obuekwe, S. A Afolalu and I. P Okokpujie

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Plastics which are made from polyethylene, due to their remarkable physical properties are among the most widely used materials in the world today with applications ranging from agriculture to food packaging and domestic uses. However, their remarkable properties are counteracted by the fact that they are not biodegradable and result in water and land pollution which are on a steady increase annually, amongst other forms of pollution. This has consequently resulted in the development of plastics which are biodegradable and at the same time are able to compete with the generic LDPE-based plastics in terms of strength and durability. This review focuses on the various results and progressions made towards developing a biodegradable plastic from a synthetic base polymer such as Low-Density Polyethylene, Polycaprolactone or Polylactic Acid by dispersing synthesized selected nanoparticle starches into the matrix of the polymer.

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OPEN ACCESS 042065

Application of MIG and TIG Welding in Automobile Industry

O.S. Ogbonna, S.A. Akinlabi, N. Madushele, P.M. Mashinini and A. A. Abioye

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Emission and weight reduction have been identified over the years by the automobile industries as the most efficient ways to maintain fuel economy and to meet the demand of the government agencies on global warming. These challenges of reducing emission and weight are even being compounded with consumers taste for luxury features which adds to the weight of the traditional vehicle designs. To meet these demands, alloys such are Aluminium Alloys, Magnesium Alloys and Titanium Alloys have been identified as the suitable materials to replace conventional steel structures due to their superior properties such as high strength-to-weight ratio, high tensile strength and high-temperature performance. With the identification of suitable materials to replace the traditional materials, the welding of alloy materials remains a challenge faced by vehicle manufacturers.

Although electron beam welding, ultrasonic welding and friction stir welding have proven to give quality weld joints of alloys used in automobile fabrication, their application is limited by the high cost of equipment, need for vacuum environment in electron beam welding, size and shape of base metals. Laser welding with its reduced heat affected zone (HAZ), good seam appearance and deep penetration has widely been applied in an automobile. However, it is not with its own shortcomings such as poor gap bridging capability, difficulty in welding reflective materials and high cost. Arc welding with its low cost compared to other welding techniques and high energy efficiency, therefore, remains a useful welding process in an automobile. In this paper, a review of the various investigations by researchers on MIG and TIG welding of alloys used in the automobile have been documented.

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OPEN ACCESS 042066

Effect of Milling Time on the Morphological Evolution of Titanium Alloy Powder

O.S. Ogbonna, S.A. Akinlabi, N. Madushele, P.M. Mashinini and A.S. Afolalu

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This work examines the influence of disc milling duration on the morphological transformation and crystal reorientation of titanium alloy powder with a particle size below 90 μm. The disc milling time was varied from 2 mins to 10 mins, the morphological features of the powders were characterized through the scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and X-ray diffractometer (XRD). From the results, milling time had a significant effect on the morphology and the orientation of phases in the titanium alloy powder. The SEM images revealed a plate-like shape compared with the un-milled powder with a spheriodal shape. It was also observed that the flattening of the particles increased with milling time. This suggests that the powder is ductile. The oxygen content of the particles increased from 3.4 wt. % before milling to above 10 wt. %. XRD results showed that the milling time did not bring about a new phase and in the position of maximum diffraction intensity, which occurred at 2θ equal to approximately 40.6°. However, there was a decrease in the crystallite size while the lattice strain became higher as milling time increased.

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OPEN ACCESS 042067

Review on The Energy and Exergy Analysis of Vapour Compression Refrigeration System Using Nanolubricant

Mercy Ogbonnaya, Oluseyi O. Ajayi, M.A Waheed and Sunday O. Oyedepo

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The vapour compression refrigeration system (VCRS) is an energy system used for preservation and cooling of household, agricultural and industrial products but the energy consumption of the system is high globally. With this challenge, the need to reduce the energy consumed and enhance its performance becomes eminent. The thermal conductivity of heat transfer fluids plays a significant role in the heat transfer characteristics of the fluid and the overall performance of an energy system. The low thermal conductivity of refrigerant can be enhanced by dispersing nanoparticles into the refrigerant. The use of nano refrigerant or nano lubricant has been found to be useful in the

reduction of energy consumption and enhancement of the VCRS performance. This review discusses the energy and exergy performance of the VCRS with the aim of identifying some critical factors that affects the performance optimization and exergy destruction within the system.

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OPEN ACCESS 042068

Sodium Chloride Inhibits Acrylamide Formation During Deep Fat Frying Of Plantain

J.J Omini, O.E Omotosho and O.D Akinyomi

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Processing is often essential in order for food to become comestible and delectable e.g. addition of salt to food during frying to improve its taste. Acrylamide is formed during processes which occur at high temperature. This study ascertains that sodium chloride (NaCl) prevents the formation of acrylamide. It also compares the effects of different concentrations of table salt on formation of acrylamide during deep frying process of plantain. Test samples were treated by immersion in 1%, 5% and 10% sodium chloride for 60 minutes at room temperature before frying. Fried and raw plantain samples were evaluated for their asparagine and acrylamide content. The results showed frying causes acrylamide synthesis in plantain. The acrylamide concentration decreased with reducing pH values and increasing sodium chloride concentration. At 5% and 1% concentration of NaCl, there was no significant difference in the amount of acrylamide formed. The result of this study also revealed that the concentration of acrylamide in plantain significantly decreased ($p<0.05$) by 98.9% in ripe plantain and 35.4 % in unripe with the addition of 10% sodium chloride. Hence, sodium chloride at a high concentration reduces the formation of acrylamide.

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OPEN ACCESS 042069

Disposal of Acid Components from Biomass Produced Syngas

A. S. Olufemi, I. Ekere and O. S. Osundare

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This article deals with the possibility of purifying syngas in a pilot-scale continuous slipstream dolomite fixed-bed, which serves to reduce tar and dust contained in the gas during the gasification of the biomass by high-temperature adsorption method. Listed in the methods here are the basic filter parameters of sorbents, test apparatus, basic operating conditions, and analytical methods used and the results obtained. Although the development of this device was not yet and, in particular, the operating conditions are still being optimized, very low tar content values have been reached behind the filter and dust in gas. These results already allow the target to be met -the possibility of introducing treated gas into the internal combustion engine.

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OPEN ACCESS 042070

Synthesis and Characterization of Selected Starch Nanoparticles as Matrix Reinforcements for Low Density Polyethylene

A. A Abioye, D. O Rotimi, O. O Fasanmi, O. P Abioye, S. A Afolalu, T. F Owoeye, O. O Ajayi and C. C Obuekwe

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The non-degradability of conventional petroleum-based plastics and their subsequent hazardous accumulation in the environment has resulted in the vital need to produce biodegradable polymer replacements.

The aim of this research was to convert locally sourced feedstock starches into nanoparticles for the purpose of modifying the matrix of Low-density polyethylene (LDPE), so as to enhance its biodegradability. The starches utilized are as follows; *Zea mays* (corn), *Ipomoea batatas* (potato), and *Manihot esculenta* (cassava).

Conversion to nanoparticles was achieved by a process called acid hydrolysis. The synthesized nanoparticles were characterized by microstructural tests such as transmission electron microscopy (TEM), energy dispersive x-ray spectroscopy (EDX), fourier transform infrared (FTIR), x-ray diffraction (XRD), and scanning electron microscopy (SEM). The characterization results indicated that the acid hydrolysis process succeeded in the conversion of the starches to nanoparticles without affecting the chemical constituents and functional groups of the starches used.

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OPEN ACCESS 042071

Spatial Design and Aural Experience in Music Schools in Lagos State

M.T Orimoloye and A.A Oluwatayo

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Sound has the ability to affect people psychologically, physiologically, behaviourally and cognitively, either negatively or positively, at all times and in all places. Architecture plays a key role in shaping sound, and in defining a certain soundscape. Architectural discourse is often dominated by visual design while the aural architecture becomes a result of the visual decisions, despite that all five senses are important to the experience of a space. Designing our soundscapes, both inside and out, is essential to creating environments which are conducive to their intended function, and do not negatively affecting inhabitants. The aim of this paper is to investigate the relationship between design strategies commonly adopted in existing music schools in Lagos State and the aural architecture it creates. In order to do this, this study has used existing literature, information from case studies and also data from the users of the existing music schools to identify the current design strategies in the music schools and how they affect the aural experience of the users. Findings show that the design strategies adopted had significant relationships with the aural architecture of the spaces, the most prominent design strategy adopted was the rectangular geometry and very little aural architecture strategies were adopted. With this understanding a tuned aural architecture design is proposed, exploring material and design manipulations, which help to create a more beneficial and enriching environment.

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OPEN ACCESS 042072

A model for efficient consumption of electricity in residential buildings

Obafemi O. Olatunji, O Olayinka Ayo, Stephen A. Akinlabi, Felix Ishola, N. Madushele and Paul A. Adedeji

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This paper reviews various applications of Radio Frequency Identification (RFID) technology and proposes electricity-saving power switch enhancement model to control the operation of electrical appliances in residential buildings using radio frequency identification (RFID) system. Estimation was made on the consumption of electricity in a private apartment in Pretoria, Gauteng Province, South Africa and compared with when the RFID card-reader system is deployed. The percentage energy saving in a year was calculated to be approximately 29 %. The possible energy savings for a period of 30years is estimated and the return on investment (ROI) determined. The authors concluded by making a case for a state policy on RFID energy efficiency technology.

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OPEN ACCESS 042073

Macroeconomic as Basis of Economic Growth : An ARDL Approach

I.J. Oluwafemi and O. T. Laseinde

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We examined the effect of some selected macroeconomic factors reflecting on Nigeria economic growth between the periods of the year 1981 to the year 2015 using Auto Regressive Distributed Lag denoted as ARDL method. Findings revealed that foreign direct investment, and trade openness were the major factors that determine real gross domestic product, especially in the short run. On this basis, this paper, therefore, concluded that increase in the net flow from foreign investors from the rest of the world has a significant effect on the Nigeria economy as it increases the capital inflow and improves economic growth.

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OPEN ACCESS 042074

Assessment of Regenerative Architecture Principles in Nigeria; A Case Study of Selected Research Institutes in Nigeria

Ukaegbu Chidinma and Fulani Omoyeni

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Buildings are an integral part of human existence, as shelter is one of the three basic needs of man. However, the design and construction of buildings, so far, has affected the natural environment negatively. The focus of research is, therefore, shifting towards buildings whose existence have minimum negative effects on the natural environment and even goes a step further to study buildings that positively influence the environment in which they are built. Nigeria, as a developing country, is also shifting towards these trends in building design and construction, however, more studies have to be carried out in order to fit these trends into our local context. This study, therefore, aims at identifying and analyzing the regenerative architecture principles adopted in the design of selected research institutes in Nigeria with a view to promote environmentally sustainable designs in Nigeria. Case studies of selected research institutes were assessed to determine the extent to which they comply with the principles and strategies of regenerative architecture, as proposed by Littman in 2009. Data was collected and analyzed using descriptive statistics and content analyses. The findings of this study suggest that the predominant strategies of regenerative architecture employed in Nigeria are those that promote and cater to energy efficiency, whilst other strategies of regenerative architecture were barely acknowledged. This paper concludes that as much as energy supply is a

major issue in Nigeria, other strategies of regenerative architecture can also be employed in the design and construction of buildings to ensure a holistic net positive impact of the buildings on the environment.

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OPEN ACCESS 042075

Comparative analysis of milling time on the particle sizes of coal fly ash and wood fly ash using Otsu Method for thresholding

O. M. Ikumapayi, E. T. Akinlabi, P. A. Adedeji and S. A. Akinlabi

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South Africa remains one of the countries with an abundance of coal fly ash (CFA) emerging from her abundant coal deposit. Despite the hazardous and environmental unfriendliness of fly ash, so many benefits can be derived therein. With new policies of waste-to-wealth, the country seeks ways by which this resource could be of value addition. However, CFA in its raw form often requires further milling operation to enhance suitability for the intended use. This study investigated the effect of milling time on the particle size of CFA and wood fly ash (WFA) using image segmentation. Both CFA and WFA received at micro-sized particles were washed with distilled water to remove impurities and dried in the oven at 80°C for 48 hours then sieved using 75μm size. Microstructural images of both CFA and WFA milled at varying times (t = 0, 20, 40, 60 *minutes*) were morphologically and physiochemically analysed using scanning electron microscope (SEM), X-ray diffraction (XRD), Energy Dispersive X-ray (EDX), and X-Ray Fluorescence (XRF). SEM images of CFA and WFA were segmented using Otsu thresholding technique and average particle sizes were estimated. CFA contains a higher composition of Al_2O_3 (30.93%) and SiO_2 (51.43%) compared to WFA, which has 10.70% and 46.31% respectively. However, WFA contains more of Fe_2O_3 (17.28%) than CFA (2.29%). The number of particle size increased with increases in milling time while the particle area decreased with an increase in milling time. At a 95% confidence interval, there exists a significant difference between results obtained at different milling time. Also, a significant difference exists between the mean particle diameters of the two ash sources.

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OPEN ACCESS 042076

Evaluation of sustainability concepts in public housing projects in ogun state, nigeria.

Ukwunna Chiamaka and Egidario B. Aduwo

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The issues associated with housing are colossal and multifaceted, displaying clear and concise differences in various parts of the world. As is the case of most urban environments, the problem of housing can no longer be limited to the quantity of houses available, it should also include the quality and the location of these housing units. As a result, this study intends to assess the different sustainability concepts adopted in the planning, design and construction of public Housing in Ogun State. The objectives of the study were to, evaluate the physical characteristics and conditions of the housing units, examine the socio-economic characteristics of the residents, and determine factors which affect the level of satisfaction of the residents. 274 housing units were assessed, from four public housing estates in the state, between the months of December, 2018 and February, 2019. Data

was gathered by administration of questionnaires as well as interviews to household heads. The data was analyzed using descriptive and inferential techniques. The result of study highlighted that the housing estates were assessed to be sustainable as regards the housing density of the units and the affordability levels, however the estates were deemed unsustainable based on type of building materials used, proximity to basic amenities, and non-existence of communal facilities. The study concluded that relevant agencies as regards housing in the state, should focus on the provision and maintenance of public facilities so as to improve resident's satisfaction and also make use of adaptable spaces when designing houses, so as to cater for unexpected growth in the family and improve quality of life of the occupants.

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OPEN ACCESS 042077

Production and Characterization of Partially Purified α-amylase from *Aspergillus niger*

M Atolagbe Oluwabunmi, A Ajayi Adesola and I Olasehinde Grace

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Alpha amylase is a class of amylases that aid in the breakdown of internal α-1, 4-glycosidic linkages in starch. They are important in various pharmaceutical, food, brewing, paper, chemical and textile industries. The aim of this work was to produce and characterize α-amylase produced by *A. niger*. *A. niger* was used to produced alpha amylase in a basal salt medium which was then purified with activated carbon. The effect of pH, temperature, substrate concentration and heat on the produced amylase was investigated. The highest activity of the enzyme was recorded at 40 °C and pH 6.0. The apparent Km value for the enzymic hydrolysis of starch was 0.13mg/ml. Heating at 70 °C greatly affected the activity of the enzyme losing up to 35% of its activity after 5 mins. Physical conditions of heat, pH and concentration of substrate are significant factors which should which affect the activity of enzymes.

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OPEN ACCESS 042078

Assessment of Biophilic Design Patterns on Skill Development, In Minna, Niger State

Q. O Akande and E. B Aduwo

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As an interactive sustainable alternative to existing sustainable design practices, biophilic design struggles to promote the possibility of merging the built and natural environment. The study is aimed at assessing the extent to which biophilic design patterns influences skill development in order to suggest interactive sustainable alternatives. The study adopted a mixed method of research. Qualitative data were obtained via the review of relevant literature while quantitative data were obtained via the use of a structured questionnaire administered to 32 respondents in the study population. The respondents were selected from the users of purpose-built skill acquisition and development spaces in Minna, Niger state, to determine the level of satisfaction with the implementation of these patterns and considerations in skill acquisition and development space. The quantitative data was analysed with the use of statistical package for social sciences (SPSS) and the

results presented descriptively with the use of tables. The findings suggest that most users were satisfied with patterns from nature in space patterns and natural analogue patterns relating to direct and indirect connection with natural systems.

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OPEN ACCESS 042079

Arduino Based Traffic Light System With Integrated LED Advertising Display

Rachael Olomo and Omoruyi Osemwegie

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Rapid advancement in scientific knowledge and growth in worldwide economic activities has led to a steep rise in the volume of vehicular activity for human and product mobility hence leading to more road constructions. Vehicular Movement controls in addition to controllers are, therefore, a critical necessity of the modern – day society. Toward this end, this paper is aimed toward the design of microcontroller-based traffic control device taking as a case study the complex layout and linkage among the service roads of the Senate building and College of Science and Technology, Covenant University, Nigeria. The Arduino platform is the microcontroller preference for this idea. Also, to make this idea more effective and productive, a Light Emitting Diode (LED) advertising displays has been incorporated into its implementation to take advantage of the red light wait time to disseminate useful information or facts.

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OPEN ACCESS 042080

Influence of Processing Parameters on the Microhardness Property of Laser Cladded Titanium Powder

V.I. Aladesanmi, S.O. Fatoba and E.T. Akinlabi

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Laser cladding techniques of additive manufacturing has been globally embraced in the most efficient means of maintenance of steel rail. Nano-composite of titanium has been used as covering layer. The processing parameters of the laser power was varied between 1.0 kW and 2.0 kW while the scanning speed, powder and gas flow rate were kept at constant. Design expert 11 software environment was used to analyze the results derived with a full factorial experiment design guide. The microhardness profiling was performed at a load of 500 g and at a dwelling time of 15 s with the microhardness indenter 20 μm distance was maintained between indentations. An almost uniform weight of Titanium powder was cladded at different variation of processing parameters. A predictive microhardness equation was generated and termss runs intercept of an orthogonal shape. The model terms were found to be significant with logical relationships. It was found that the microhardness increases as the laser power increased.

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OPEN ACCESS 042081

Experimental Performance of a Domestic Refrigerator with TiO_2-Nanoparticles Operating Within Selected Ambient Temperature

L. J. Akinlesi, D. S. Adelekan, O. S. Ohunakin, O. E. Atiba, J. Gill and A. A. Atayero

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This study presents a 40g R600a charge enhanced with various TiO_2 nano-lubricant concentrations (0 g/L and 0.2 g/L nano-lubricants) infused into an R12 domestic refrigerator tested within selected ambient temperature conditions (19, 22 and 25 °C). The performance test parameters including: energy consumption, discharge pressure, power per tonne of refrigeration (PPTR) and coefficient of performance (COP) were evaluated for the system. The results showed that infusing the nano-lubricant into the system improved the energetic performance of the system. Overall, the use of 40g at 25°C gave the best performance within the system. In conclusion, application of nanoparticles in refrigeration systems was found to improve the performances of the system even with the effect of ambient temperature. R600a-TiO_2 nano-lubricant mixture works safely and efficiently in the domestic refrigerators but requires adequate optimization.

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OPEN ACCESS 042082

Performance Evaluation of Hydrocarbon based Nanorefrigerants Subjected to Periodic Door Openings

T. E. Okotie, D. S. Adelekan, O. S. Ohunakin, J. Gill, O. E. Atiba and A. A. Atayero

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Domestic refrigerators are required to be energy efficient and environmentally safe. In this work, a slightly modified domestic refrigeration system was infused with various concentrations (0, 0.2, 0.4 and 0.6 g/L) of TiO_2 nanolubricants and R600a refrigerant with a mass charge of 40g. The average energetic characteristics of the test rig at different door openings intervals (0.5, 1, 2, 3 and 5 minutes) were evaluated. The energetic characteristics studied were coefficient of performance (COP), refrigeration capacity, power consumption and cabinet temperature recovery time. The results obtained showed that the use of nanolubricants significantly affect the energetic performance characteristics of the system. Overall, the utilization of 0.6g/L concentration of TiO_2 nanolubricant gave the best performance. The COP of the system improved by 22.39 %, while the power consumption decreased by 23.5 % when compared with pure R600a refrigerant.

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OPEN ACCESS 042083

Experimental Performance of the Energetic Characteristics of a Domestic Refrigerator with Al_2O_3 Nanolubricant and LPG Refrigerant

M. A. Onakade, D. S. Adelekan, O. S. Ohunakin, O. E. Atiba, J. Gill and A. A. Atayero

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This paper studies the experimental performance of the energetic characteristics of a slightly modified domestic refrigerator infused with nano-lubricant containing different concentrations of Al_2O_3 (at 0, 0.2, 0.4 and 0.6 g/L) with liquefied petroleum gas (LPG) charge of 40g. Parameters investigated were power consumption, cooling capacity, coefficient of performance (COP), discharge temperature, volumetric refrigerating capacity (VRC) and pressure ratio. The findings showed that when the nano-based lubricants were compared with pure oil, the power at 0.6g/L concentration, gave the best performance of 67.01W, at different time over 180 minutes' periods. The discharge

pressure of the system when compared to pure-oil at 0.6g/L concentrations exhibited acceptable value of 616. 33kPa. For the cabinet temperature, it was seen that the 0.6g/L had the lowest recorded temperature of -8.7°C after 180 minutes. With the coefficient of performance, the 0.2g/L concentration had the highest average performance of 2.239 at 180 minutes. The highest average performance of 174.225 kW over 180 minutes was found as the refrigerating capacity at 02.g/L concentration. The nano-lubricant can be concluded to work safely in the refrigerator but better optimization in nano-application will still be needed for better results.

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OPEN ACCESS 042084

A Review on the Efficacy of Electroplating in Deteriorating Environments

O S I Fayomi, I G Akanade and A A Sode

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Electroplating is an electrochemical process that involves a chemical response of the constituents in an aqueous mixture, due to galvanic excitation that causes the formation of thin film layers i.e. the coating, on the substrate of the material. Very few surface finishing techniques exist that serve the purposes of various functional applications and aesthetic appeal. Electroplating stands out as one of those surface finishing techniques that impact peculiar properties. This paper presents an overview of the multifunction application and efficacy of electroplating in different corrosive environments.

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OPEN ACCESS 042085

Electrochemical evaluation of the corrosion inhibition effect of essential oil extracts on mild steel in acidic environments

Roland T. Loto, Tiwa Olukeye and Eugene Okorie

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The corrosion inhibition property of the combined admixture of neem leaf and basil oil extracts (NB) on mild steel in in 1M H_2SO_4 and HCl solution was studied with weight loss measurement, potentiodynamic polarization and optical microscopy analysis. Results shows NB performed effectively at all concentration studied in HCl solution with average inhibition efficiency above 94% and 91% (weight loss and polarization test) whereas the compound performed poorly in H_2SO_4 solution at all concentrations (excluding highest concentration, 2.5%) with average inhibition efficiency of 17% and 31%. At 2.5% concentration in H_2SO_4, the inhibition efficiency is 98.34% and 85.36%. NB exhibited mixed type inhibition property from the polarization plots. This observation was further confirmed from optical characterization of the steel surfaces where the morphology of the inhibited steel was relatively smooth while the non-inhibited morphology was badly corroded with visible corrosion pits.

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OPEN ACCESS 042086

Mitigating biodiversity destruction through environmental impacts assessment of infrastructural projects

E I Ugwu, A C Ekeleme, S TA Okolie, O P Ibe, C F Chieke, H O Ibearugbelem, M Omeje, P O Awoyera and A N Ede

The geometric rate of biodiversity loss in developing countries like Nigeria has been identified as a problem of major concern. The loss in biodiversity in modern times is evident in the extinction of many plants and animal species. In developing countries like Nigeria, more attention is given to aesthetics, functionality as well as the cost of proposed projects than the environmental impacts of the projects. During construction and rehabilitation of infrastructural projects, biodiversity is destroyed. Thus, this study was aimed at exploring the various ways by which infrastructural projects affect biodiversity, with a view to proffering ways of its restoration. The negative effects of infrastructural projects on biodiversity can be reduced through Environmental impact Assessment (EIA). This will help in averting the detrimental effects on natural resources. In situations, where natural habitat loss is unavoidable, adequate mitigation measures such as provision of strict protection zones along the proposed projects should be adopted. In order to meet sustainable development goal, EIA should be carried out before projects that may have a negative impact on the environment are constructed.

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OPEN ACCESS 042087

Universal Design Of Selected Secondary Schools In Akwa Ibom State, Nigeria: Students' Perception Of Accessibility Provisions In Meeting Their Needs

A. B Sholanke, A. P Opoko, O. S Akpan and T. F Adigun

A building or environment is usually expected to be designed to meet the accessibility and usability needs of its potential user, which include both able-bodied persons and physically challenged. Universal design (UD) is a development strategy for planning and developing buildings and environments to be easily comprehended, accessible and usable to the highest degree possible by all individuals regardless of their age, size, ability or inability. It is however observed that the physically challenged are often sidelined with inadequate or inappropriate accessibility provisions in public environments, including schools in Nigeria. To this end, the study examined the effectiveness of accessibility provisions in meeting users' needs in selected secondary schools in Akwa Ibom State, Nigeria, with a view to making contributions on how to improve access to use such environments for users, irrespective of their mobility status in conformity with the ambition of UD ideology. The study was conducted in other to identify areas for further improvements based on users' perception, towards enhancing social inclusion in academic environments in Nigeria. The study was designed as a cross sectional survey research that spans across three selected secondary schools in the study area. The study employed quantitative research methods, using structured questionnaire to gather data from a sample size of 136 students across the three secondary schools. The data was analysed with the 2016 version of Microsoft Excel software. Descriptive approach with the use of tables was used to present the findings. The result indicates that the only accessibility provisions considered not effective in meeting users' needs are ramps. Among the key recommendations of the study is for locations where ramps are necessary, but not provided for in the schools, to be retrofitted with accessible ramps for the benefit of physically challenged users, towards improving social inclusion in

the schools. The outcome of the study will be useful for providing direction to building professionals and policy makers towards making adequate and appropriate provisions for accessibility components that are effective for encouraging social inclusion in the development of educational environments.

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OPEN ACCESS 042088

Effect of Superplasticizer on Workability and Properties of Self-Compacting Concrete

A.M. Olowofoyeku, O.M. Ofuyatan, J. Oluwafemi, A. Ajao and O. David

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From recent issues of stability, particle suspension, particle segregation, flow characteristics and cohesiveness in concrete, Superplasticizer has played an important role in this part. This research examined the effect of superplasticizer on workability and properties of self-compacting concrete (SCC). Three types of superplasticizers Conplast SP 561, Conplast SP 430 and Conplast SP 264 at different percentages (0, 10, 20 and 30%) with the same water cement ratio of 0.3, with M30 grade of concrete. The workability slump, v-funnel and l-box the test carried out on fresh concrete. Compressive strength test was carried out on the hardened concrete. All mix were satisfactory but the mix with conplast SP 430 had better workability and strength.

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OPEN ACCESS 042089

Incorporation of Silica Fume and Metakaolin on Self Compacting Concrete

O.M. Ofuyatan, A.M. Olowofoyeku, S.O Edeki, J. Oluwafemi, A. Ajao and O. David

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This study carried out an experimental design investigating the reaction of mineral admixtures on fresh and hardened properties of sustainable self compacting concrete (SCC). Silica fume (SF) and metakaolin (MK) were partially replaced by Portland cement at 5, 10, 15, 20 and 25% in varying proportions. The workability on the fresh concrete was examined and the strength performance. The water cement ratio of 0.38 was kept constant for all the samples tested. The compressive strength was measured at 7, 14, 21 and 28 curing days. The test results indicated that with the influence of 2% superplasticizer, the fresh concrete showed a satisfactory workability, decreased the segregation to resistance, ease of flowing ability with the addition of silica fume and metakaolin. It was concluded in this study that, the replacement with silica fume was found to have an early strength gain in the compressive strength of SCC samples and a decrease at varying dosages. However, 15% metakaolin was considered to be a suitable replacement with 49.08 MPa at 28days compared with the control mix..

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OPEN ACCESS 042090

"Crude distillation overhead system": Corrosion and Control.

M.A. Fajobi, R.T. Loto and O.O. Oluwole

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Corrosion problem has been a major challenge in the crude distillation overhead system of the petrochemical industry. It affects every part of the metallic structures of the crude distillation overhead system due to contaminants from crude oil. As a result of this, lots of revenue are been incurred to tackle it. This review therefore discussed the definition of a crude distillation overhead system, its working principle, the structural material for constructing crude distillation overhead system, the types of corrosion that occurs in crude distillation overhead system, the economic cost, the prevention and control methods employed in crude distillation overhead system. Also, the review showed that materials used for crude distillation overhead system, such as carbon steels, are mostly affected by pitting corrosion, intergranular corrosion and general corrosion. In addition, the review showed that the use of material selection, inhibitors, protective coating and cathodic protection are the common prevention and control methods usually employed in crude distillation overheard system. However, the review stated that the use of inhibitor is the most trusted and time tested as the proven method of prevention and control in crude distillation overhead system. This will help to reduce the huge economic cost incurred on corrosion effect in petrochemical industry, especially in the crude distillation overhead system.

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OPEN ACCESS 042091

Development of Cashew nut Shelling Machine

O. Kilanko, S.J. Ojolo, A.O. Inegbenebor, T.A. Ilori, R.O. Leramo, P.O. Babalola, S.O. Oyedepo, F.A. Ishola and P.N. Onwordi

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Cashew nut shelling machine was designed using impact method to improve shelling efficiency and whole kernel recovery for nuts roasted in hot oil. This was based on the principle of the optimum kinetic energy that could break the cashew nut shell. Deformation energy used was 4.8763 Joules, angular velocity of the impeller calculated from the energy was 26.43 rad/s which was equal to 252 rpm and minimum power required was calculated to be 257.7 Watts. The prototype of cashew nut sheller was constructed and evaluated for its shelling efficiency and whole kernel recovery using three levels of moisture content (7.00%w.b., 8.46%w.b. and 9.83% w.b.), three levels of impeller speeds and three nut sizes (large, medium and small). The results showed that moisture content has significant effect (at $P < 0.05$) on the shelling efficiency and whole kernel recovery of the nut for the three nut sizes while the impeller speed showed no significant effect. The optimal performance of the machine on large nuts for whole kernel recovery and shelling efficiency were 59.65% and 82.0% respectively at 1759 rpm and 7.00% w.b. For medium nut, they were 53.2% and 92.2% respectively at 1538rpm and 9.83% w.b. For small nut, they were 45.1% and 79.7% respectively at 1704 rpm and 7.00% w.b. Impact shelling methods works well with large cashew nuts as these exhibit higher whole kernel recovery than medium and small nuts.

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OPEN ACCESS 042092

Dynamic Spectrum Sensing with Automatic Modulation Classification for a Cognitive Radio Enabled NomadicBTS

Folarin J. Olaloye and Emmanuel Adetiba

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An existing Nomadic Base Transceiver Station (NomadicBTS) architecture designed and implemented in the literature was built on software defined radio technology. This technology performs radio functions via software modules. Cognitive radio on the other hand is essentially built on software defined radio technology integrated with artificial intelligence. This research work extends the existing NomadicBTS architecture with cognitive radio capability for the purpose of introducing dynamic (opportunistic) spectrum sensing for efficient spectrum utilization in mobile networks. This is achieved by developing an Automatic Modulation Classification (AMC) model for spectrum sensing based on MultiLayer Perceptron (MLP) Artificial Neural Network (ANN). A suitable AMC model with optimum accuracy of 92.57% and Mean Square Error (MSE) of 0.0185 was empirically determined and deemed acceptable for incorporation into the NomadicBTS architecture.

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OPEN ACCESS 042093

Insurance Receivables and Economic Growth: The Case of Nigeria

A.T. Nwani and A. E. Omankhanlen

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The study was undertaken to establish the impact of insurance receivables on economic growth using life premium, non-life premium and insurance investment as the proxy for insurance receivables. The insurance industry is one which has strived in the face of economic crisis and is still striving to grow, with so many claims to settle, the insurance industry tends to invest their premium from life and non-life insurance policies so to offset claims, gain income and also contribute to the economy. This study hence conducted a research to know the extent to which these premiums and investment have impacted on the Nigerian economic growth. The study used the panel data between the periods of 2008-2017 among six insurance companies. The panel OLS was used to analyze the data and the hausman test was used to adopt the random effect result used to interpret the data. The result of the study showed that the life premium was positively insignificant to economic growth; the non-life premium was negatively insignificant to economic growth while the insurance investment was positively insignificant. This insinuates that the insurance industry has very little impact on the Nigerian economic growth. Further studies should be carried out by increasing the number of years for the data, the number of insurance companies and more variables can be added.

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OPEN ACCESS 042094

Performance Comparison of ANN Training Algorithms for Hysteresis Determination in LTE networks

E E Ekong, A A Adewale, A Ben-Obaje, A M Alalade and C N Ndujiuba

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Long-Term Evolution (LTE) network is an improved standard for mobile telecommunication system developed by the 3rd Generation Partnership Project (3GPP) requires an efficient handover framework which would reduce hysteresis and improve quality of service (QoS) of subscribers by maximizing scarce radio resources. This paper compares the performance of two ANN prediction algorithms (LevenbergMarquadt and Bayesian regularization) based on received signal strength (RSS) and the hysteresis margin parameters for neuro-adaptive hysteresis margin reduction

algorithm. The Bayesian regularization algorithm had a lower mean error when compared with the Levenberg-Marquadt (LM) prediction algorithm and as such a better option for neuro-adaptive hysteresis margin reduction algorithm.

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OPEN ACCESS 042095

Design of a fluorescent tube antenna with defined copper wire coupling specifications

A M Alalade, C Ndujiuba, A A Adewale, E E Ekong and M N Etta

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In this paper, the performance of a fluorescent tube antenna is analyzed with respect to the dimensions of copper wire utilized in RF coupling. The fluorescent tube antenna in the study is implemented using a 58.5cm long fluorescent tube with a diameter of 2.7cm and four different copper wires with provided dimensions, wound at specific chosen lengths. RF signals are generated and output power measured using a Handheld RF Signal generator and Spectrum Analyzer respectively. The performance index used to evaluate the improved functionality of the design presented is the Received Signal Strength (RSS) and the gain. A peak RSS value of -34 dBm is obtained using a 1mm thick copper wire wound at 50cm of the fluorescent tube length and the gain of the antenna is 14.37 dBi derived with the Friis Transmission Equation. Research findings are presented and compared to previous similarly conducted studies, and seen to perform favorably better.

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OPEN ACCESS 042096

Subscribers' Traffic Internet Bandwidth Usage Capture and Classification Using Android Platform

A A Adewale, A Ben-Obaje, E E Ekong, A Orimogunje, H K Anabi and O Omoruyi

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With the rise in smart devices communicating on internet, there is a huge demand in the delivery of internet bandwidth to fulfil subscribers' aspirations. It is therefore important for internet network providers to understand the subscribers' behavioural pattern in terms of internet bandwidth usage so as to meet up with the continuous rise in its demand. This research introduces the schematics of an android application effectively communicating with a remote database; Firebase cloud service. The classification of the subscribers' internet traffic bandwidth consumption enables the android application to generate dataset of bandwidth utilization patterns of volunteered subscribers' device which are grouped into 4 classes; A, B, C and D representing very high, high, medium and low data usage respectively. The collection of internet bandwidth usage of subscribers was recorded at intervals of every hour into the remote database in Firebase cloud.

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OPEN ACCESS 042097

Synthesis of biomedical Ti-25Ni-15Si-10HA alloy by mechanical alloying and spark plasma sintering

P. S. Bains, S. Mohal, J. Gill, O.S. Ohunakin and D.S. Adelekan

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In this research approach, a β-phase titanium alloy was produced successfully employing mechanical alloying and consolidated with spark plasma sintering (SPS) process. Herein, Ni, Si and HA powders with varied weight percentage were used to fabricate the Ti alloy. The influence of HA addition on microstructure of the alloy was assessed using optical microscopy route and further amplified using field emission scanning electron microscopy (FESEM). The elemental composition and phase of Ti-alloy was investigated using x-ray diffractometer. Vicker hardness (HV) tester was employed to estimate the micro hardness of the specimen surface. During the FESEM analysis, it was observed that within the sintering process, alloy exhibits complex reactions with HA, which leads to the progress of bioactive compounds (CaO, TiO_2, Ca_3 $(PO_4)_2$, Ti_2Ni, $CaTiO_3$ and $CaTiSiO_5$) enhancing the bioactivity of the Ti alloy. The fabricated Ti alloy (Ti-25Ni-15Si-10HA) exhibited superior microhardness (~458HV) at 900°C, comparative to the other alloys of the native category. Based upon the current investigation, Ti-25Ni-15Si-10HA alloy could find applications as bioimplants in dental and orthopedic areas.

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OPEN ACCESS 042098

Design and Fabrication of a Vertical Axis Wind Turbine with introduction of Plastic Gear

J. K. Adebayo, A. T. Layeni, C. N. Nwaokocha, S. O. Oyedepo and S. O. Folarin

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This project is a design of Vertical Axis Wind Turbine using Kinetic theory, Aerodynamics model, Hooke's law and Young Modulus. Aerodynamic model method was use to design the blade and the blades are three for effective harness of the wind speed. Bearing was introduced for easy rotation and reduction of noise. The use of plastic gears was introduced so that one revolution of the shaft carrying the blades leads to forty six (46) revolution of the alternator. The alternator then generate electric power. The power generated was 65 W under wind speed of 0.8m/s..

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OPEN ACCESS 042099

Mitigating Biodiversity Destruction of Infrastructural Projects through Environmental Impacts Assessment

E.I. Ugwu, A.C. Ekeleme, S.T.A. Okolie, O.P. Ibe, C.F. Chieke, H.O. Ibearugbulem, M. Omeje, P.O. Awoyera and A.N. Ede

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The geometric rate of biodiversity loss in developing countries like igeria has been identified as a problem of major concern. The loss in biodiversity in modern times is evident in the extinction of many plants and animal species. In developing countries like Nigeria, more attention is given to aesthetics, functionality as well as the cost of proposed projects than the Environmental Impacts of the projects. During construction and rehabilitation of infrastructural projects, biodiversity is destroyed. Thus, this study was aimed at exploring the various ways by which infrastructural projects affect biodiversity, with a view to proffering ways of its restoration. The negative effects of infrastructural projects on biodiversity can be reduced through Environmental Impact Assessment

(EIA). This will help in averting the detrimental effects on natural resources. In situations, where natural habitat loss is unavoidable, adequate mitigation measures such as provision of strict protection zones along the proposed projects should be adopted. In order to meet the Sustainable Development Goal, EIA should be carried out before projects that may have a negative impact on the environment are constructed.

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OPEN ACCESS 042100

Thermo-physical, Electrical and Mechanical Characterizations of Normal and Special Concretes: A Holistic-Empirical Investigation for Pre-qualification and Quality-Control of Concrete

Osagie Ibhadode, A. A. Adekunle, Solomon O. Banjo and O. D. Atakpu

Nine(9) Concrete specimens (Concrete test-materials) [comprising of 3 'Portland Cement Normal Concrete specimens', 3 'Portland Slag Special Concrete specimens' and 3 'Silica-fume Slag Special Concrete specimens'] were designed-for in accordance with ACI 211.1-91, cast in accordance with ASTM C 127 and cured for three(3) Curing-ages of 28 days, 56 days and 90 days. Each was subjected to eleven (11) Quality (Strength, Durability & Workability)-evaluation experimental-tests in accordance with the relevant ASTM, BSI and other scientifically-established standard procedures, so as to empirically determine their Thermo-physical, Electrical & Mechanical characterizations (behavioural-changes) and the various determining (influencing) factors (variables). Summarily, it was experimentally discovered that, Supplementary Cementitious Material (SCM) content and Maturity (Curing-age) significantly influenced (affected) five (5) conducted Thermo-physical characterization-tests of 'Specific Heat Capacity (C_{θ})', 'Thermal diffusivity ($\delta_{Thermal}$)', 'Thermal Conductivity ($K_{Thermal}$)', 'Dry bulk density ($\rho_{bulk\ dry}$)' and 'Water sorptivity (S)' of Concrete. Also, it was observed that the five (5) conducted Electrical characterization-tests i.e. 'RCPT Total Electric Charge passed ($\sum Q_P$)', 'Chloride-ion Penetrability', 'Initial 5 minutes RCPT Electricity Resistivity ($\rho_{E(RCPT)}$', 'Chloride-ion Penetration-depth (Cl^-_{pd})' and 'Non-steady state migration coefficient (D_{nssMC})' of Concrete largely depended on the Water/Cement (w/c) ratio, Maturity (Curing-age) and SCM content. Furthermore, it was noticed that Mechanical characterization-test i.e. "Average Compressive-strength' and 'Slump' of Concrete is primarily a function of w/c ratio, SCM content, Maturity (Curing-age) and several other factors. Consequently, it has been experimentally revealed that amongst other things, the four (4) critical determinants of Concrete quality are the Concrete's Water/Cement (w/c) ratio, Maturity (Curing-age), Supplementary Cementitious Material (SCM) content and Bulk density.

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OPEN ACCESS 042101

Anti-mycobacterial and GC-MS Studies of *Irvingia gabonensis* Baill Ex. Lanen Stem Extracts

I. O. Olanrewaju, R. C. Mordi, J. O. Echeme, T. F. Owoeye, O. Ejilude and A. O. Aruwajoye

Irvingia gabonensis baill ex. lanen (Bush mango) is an ethno-medicinal plant that has been used for traditional therapeutic purposes. With the increasing rate of drug resistance to various diseases in the society today, there is the need for alternative sources of drugs for the treatment of such disease. The Bush mango plant presents a potential candidate for such drugs discovery. Extracts from the plant stem were derived by cold maceration separately in methanol (MeOH) and Dichloromethane (DCM) for a period of 7 days. Phyto-constituents were also identified in extracts of stems by using hyphenated mass spectrometer and chromatographic technique, the Gas Chromatography - Mass Spectrometer (GC/MS) while the functional group of such phyto-constituents were identified with the aid of Nicolet 5700 Fourier Transform– Infra-Red spectrometer. Anti-tubercular screening was performed on extracts against clinically isolated drug-susceptible strains (DS-MTB-1 - DS-MTB-5), drug resistant strains (DR-MTB-1, DR-MTB-2) and a standard tubercular strain, H37Rv. This was controlled with drug standards, rifampicin and levofloxacin. Extracts revealed the presence of phyto-constituents such as saponins, tannin, alkaloids and phenol. It was observed that both extracts recorded high % alkaloid content at 10.37±0.02. Also, identified by FTIR as the principal part of the extracts are hydrocarbon groups such as carboxylic acid (1042), while the presence of the volatile components such as 9-Oxabicyclo [6.1.0] nonane ($C_8H_{14}O$) and 1-Chlorobutatriene (C_4H_3C) were reported by GC-MS. Extracts exhibited significant anti-tubercular activity against all organisms. Therefore, this study promotes the use of *Irvingia gabonensis* baill ex. lanen for phytotherapeutics purposes.

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OPEN ACCESS 042102

Enhancing the Hardness of Al 6063 Alloy Via Equal Channel Angular Extrusion Process

O. P Abioye, P. O Atanda, A. A Abioye, O. O Ajayi, E. T Akinlabi and S. A Akinlabi

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Hardness of a material is highly important in most architectural and engineering applications, especially considering its direct relationship with strength. As a result of this, methods of enhancing the hardness properties of materials, such as Al 6063 alloy, will of a great benefit to researchers, engineers, and architects. This study presents the effect of Equal Channel Angular Extrusion (ECAE) in enhancing the hardness of Al 6063 Alloys. ECAE is known to develop ultrafine-grained materials, which tend to be characterised by better hardness. Sets of samples made of Al 6063 were obtained, fabricated into the sizes of ECAE specimen, and grouped into seven parts. A part was taken as the control while the other six parts were went through a Sever Plastic Deformation (SPD) Process using the ECAE method. A part was extruded once, another twice, another 4 times, another 5 times and another 6 times. The microhardness values were obtained and reported, likewise, the calculated brinell hardness values were reported. From the results, it was concluded that ECAE increases the hardness of Al 6063 to an extent.

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OPEN ACCESS 042103

A reliable strategy for slug flow attenuation in pipeline-riser systems

Adegboyega B Ehinmowo, E.T Evwierhoma, Aliyu M. Aliyu and Yahaya D. Baba

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Oil and gas activities across the globe now take place deep offshore. To operate in this harsh environment, there are numerous challenges. These can be in the form of high cost of production, space constraints, operational and technological demands. The co-transportation of oil and gas in same pipeline is one of the operational and technological approaches adopted in the industry to meet the transportation of produced crude. This approach comes with its attendant flow assurance difficulties. Slugging is one of such problems which can constitute operational hitches resulting in production reduction and sometimes eventual plant shutdown. Existing attenuation techniques are limited in various ways. Therefore, seeking a reliable solution to this problem is highly desired.In this study, an experimental study of multiple techniques for slug attenuation was attempted. A passive device-the intermittent slug absorber, topside choking and topside separator were investigated. The results show that a combination of the methods proves to be more effective compared to individual techniques. A significant reduction in riser- base pressure of up to 39% was achieved. This is advantageous and translates to an increase in oil recovery. Thus, the proposed strategy helps to achieve system stability and improved production at a lower cost.

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OPEN ACCESS 042104

Application of business intelligence technique to manufacturing system with stochastic process (a case study of "product-based" manufacturing company in nigeria with make-to-order strategy)

Ayanlowo Babatunde, Christian Bolu, Festus Oyawale and O.S.I Fayomi

Manufacturing outfit in Nigeria with make-to-order strategy continually contend with the problem of long waiting time of customers for orders, which arose through inability to predict order quantity amount for customers. This indicates the need for the application of business intelligence technique on large amount of unused data in manufacturing databases, to evaluate and validate probability distribution model that is best suitable for prediction of customers' order values and subsequently using the best model to predict daily and yearly customers order amount. Many models were evaluated for data extracted from a manufacturing outfit and the best model was selected based on statistical goodness of fit. The normal distribution model was found most appropriate for the prediction of daily and monthly order quantity amount. Based on this, the application of business intelligence technique on extracted data has made the prediction of customers order for a product-based manufacturing outfit with make-to-order strategy possible.

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OPEN ACCESS 042105

Experimental Study on the Use of Waste Polyethylene Terephthalate (PET) and River Sand in Roof Tile Production

G. O. Bamigboye, B. U. Ngene, D. Ademola and J. K. Jolayemi

This study deals with the effects of using Polyethylene Terephthalate (PET) and river sand in roof tile production. This work is based on experimental study of roof tiles produced with river sand and recycled PET in varying proportion of 10%, 20%, 30%, 40%, 50%, 60% and 100% of PET combined

with the corresponding fine aggregate percentage. The PET plastics used were derived from waste plastic bottles for soft drinks. The shredded plastic was subjected to heat and ensured that it does not lose it's plasticity. The tests which were performed to evaluate the physical and mechanical performance of this material were sieve analysis, specific gravity, water absorption, density and compressive strength. The results show that recycled PET replacement gives better results for 40 and 50% of plastic composite tile than Ordinary Portland Cement (OPC) at 28 days. In conclusion, the plastic composite tiles have both good strength and absorptive property for roof tiling.

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OPEN ACCESS

042106

A Study on the Corrosion Inhibition Effect of Hexamethylene Tetramine on Welded API 5L X70 Steel in E10 Fuel Ethanol Environment

O. O. Joseph, K. O. Babaremu and J. A. Adeniyi

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The inhibition effect of hexamethylenetetramine (HT) in E10 environment for the corrosion protection of welded API 5L X70 pipeline steel was examined using immersion tests. Welded samples of API-5L X70 steel of dimension 30 mm x 15 mm were immersed into E-10 fuel ethanol containing hexamethylenetetramine concentration of (0.2, 0.4, 0.6, 0.8) g and the control for a minimum of 4 days and a maximum of 28 days. Analysis was done using mass loss, corrosion rate, inhibitor efficiency and ANOVA test. From the mass loss and corrosion rate analysis, it was observed that 0.2g HT, which was the lowest concentration of inhibitor, proved best for inhibiting corrosion at 24 days.

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