



3.3.2 Number of research papers per teachers in the Journals notified on UGC website during the last five years

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Assessment of single slope solar still using block and disc magnets via productivity, economic, and enviro-economic perspectives: a comparative study

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Abstract

In this research, the productivity, economic, and enviro-economic analysis of single slope solar stills using block magnets (BMSS) and disc magnets (DMSS) were performed under the climatic conditions of Coimbatore city (latitude, 11° 01' 68" N, and longitude, 76° 95' 58" E), in India, 2019. The results observed in BMSS and DMSS were compared with conventional solar still (CSS) under the same climatic conditions. The usage of block and disc magnets in basin of solar still was improved the daily productivity significantly. The results showed that the performance observed in BMSS was notably higher than the performance of DMSS. The hourly productivity in BMSS was 5.8% and 13.7% higher when compared to DMSS and CSS, respectively. The cumulative productivity in BMSS, DMSS, and CSS were found to be about 3.15 kg/m², 2.82 kg/m², and 2.15 kg/m², respectively, for 12h observations. In economic analysis, the estimated payback period (PBP) of BMSS, DMSS, and CSS were about 3.6 months, 3.5 months, and 4.5 months, respectively. Furthermore, the CO₂ emission of BMSS, DMSS, and CSS were observed to be about 11.04 tons, 9.37 tons, and 6.45 tons, respectively. The overall observations showed that the magnetization of saline water has significantly improved the solar still performances.

Keywords Block magnets · Disc magnets · Economic · Enviro-economic · Productivity · Solar still

Introduction

A ratio of fresh water availability is limited due to population growth and globalization. The impact in demand of potable water is converted as a big threat to the human society. In order to overcome this, desalting the excess saline or brackish water will be the good option in this present situation (Sivakumar and Ganapathy Sundram 2013). Desalination using available renewable energy sources is one of the

effective method to limit the demand of potable water. In these renewable energy source-integrated techniques, solar desalination has consistent rise in producing the purified water. Hence, the required potable water for remote area is extracted using solar distillation method which is very simple to operate. The device used for this solar distillation is called solar stills. The fabrication of solar stills is easy and is economically viable. The available saline water in the solar still basin gets evaporated due to higher heat accumulation by solar energy. The generated bouncy force on the saline water surface lifts the vapor towards to the inner glass cover. The higher temperature difference between the saline water surface and inner glass cover leads the condensation. Finally, the distillate is observed in collection jar. The productivity performance of solar stills have significantly improved with the use of different types of heat storage materials such as sand, gravels, jute cloth, cotton cloth, and paraffin wax (Dhivagar and Sundararaj 2018). Sharshir et al. (2018) improved the daily productivity in solar still using copper oxide and graphite nanoparticles by 41% and 32%, respectively, when compared to CSS. Mohamed et al. (2019) used basalt stones in basin of

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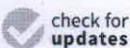


Review

Recent Progress in Nanomaterials Modified Electrochemical Biosensors for the Detection of MicroRNA

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Abstract: MicroRNAs (miRNAs) are important non-coding, single-stranded RNAs possessing crucial regulating roles in human body. Therefore, miRNAs have received extensive attention from various disciplines as the aberrant expression of miRNAs are tightly related to different types of diseases. Furthermore, the exceptional stability of miRNAs has presented them as biomarker with high specificity and sensitivity. However, small size, high sequence similarity, low abundance of miRNAs impose difficulty in their detection. Hence, it is of utmost importance to develop accurate and sensitive method for miRNA biosensing. Electrochemical biosensors have been demonstrated as promising solution for miRNA detection as they are highly sensitive, facile, and low-cost with ease of miniaturization. The incorporation of nanomaterials to electrochemical biosensor offers excellent prospects for converting biological recognition events to electronic signal for the development of biosensing platform with desired sensing properties due to their unique properties. This review introduces the signal amplification strategies employed in miRNA electrochemical biosensor and presents the feasibility of different strategies. The recent advances in nanomaterial-based electrochemical biosensor for the detection of miRNA were also discussed and summarized based on different types of miRNAs, opening new approaches in biological analysis and early disease diagnosis. Lastly, the challenges and future prospects are discussed.

Keywords: nanomaterial; electrochemical biosensor; MicroRNA; signal amplification strategy

1. Introduction

MicroRNAs (miRNAs) are small size (19–24 nt) endogenous non-coding, single stranded RNAs which modulate the expression of their target genes. They possess high stability even in extreme conditions that cause degradation of most RNAs [1]. miRNA was first discovered in *Caenorhabditis elegans* when the lin-4 gene expression was found to regulate the developmental stage of larvae, thereby revolutionizing the molecular biology field [2,3]. They play crucial regulatory roles in a wide variety of biological processes, such

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Editorial: Technologies for Water Quality and Wastewater Management in Developing Countries

Demand for water resources has increased dramatically as a result of population and economic expansion. Consequently, 36% of the world's population now lives in water-stressed areas. Rapid urbanization, particularly in low- and middle-income nations, has caused a slew of water-related issues, such as degradation of water quality, insufficient water supply and sanitation facilities, and the rise of suburban and informal settlements. Good water quality is essential for human health, socio-economic development and ecosystems. However, as the population grows and the natural environment deteriorates, it becomes increasingly difficult to ensure adequate and safe water supply for all. A predominant part of the answer is to lessen pollutants and enhance wastewater control practices. Water must be properly managed throughout the water cycle, from freshwater withdrawal, pre-treatment, distribution, usage, collection, and post treatment to the usage of treated wastewater and its eventual return to the environment. Population expansion, increased urbanisation, and economic development are all contributing to an increase in the volume of wastewater created globally, as well as the total pollutant load.

Recently, there was a great boom on the need for revolutionary environmental technology to make certain the sustainability of the water sector. Depending on how the waste is discharged and the nature of the components present in it, the remedy may also comprise one or more of the following processes: equalisation, neutralisation, physical remedy, chemical remedy, organic remedy. Conventional wastewater technologies are limited to treating these pollutants, which could exacerbate the problems the world already faces with drinking water. Consequently, there is an urgent need to develop new methods to mitigate the effects of wastewater on the already degraded environment. To date, more than 100 techniques have been documented for organic and inorganic wastewater treatment. Several of these techniques have emerged and range from chemical and physical methods to biological methods. The need for research, financing, and technological deployment to provide long-term solutions for poor and middle-income nations is relevant.

Taking these into consideration, the special issue titled 'Technologies for Water Quality and Wastewater Management in Developing Countries' is dedicated to endorsing papers that provide know-how in particular on novel standards and equipment for water fine tracking and assessment, sustainable tactics for remediating wastewater and formulating guidelines and policies for powerful water and wastewater control structures for city regions of developing nations. In this special issue of Water Science & Technology, 56 papers were selected from 19 different countries that contribute to a broad discussion and demonstration of state-of-the-art in novel technologies in the field of water and wastewater management. This special issue makes a contribution to fixing water-demanding situations through generating precious analytical insights that make sure water security, shield the water environment, and engage water management. Furthermore several papers in this issue emphasize water and wastewater management nexus such as sustainable wastewater remediation methods and techniques, wastewater reuse strategies, design and operation of wastewater treatment facilities, use of membranes in wastewater treatment, novel characterization and quantification techniques for urban water, water quality monitoring and assessment, water conservation and protection, energy recovery, valorization of wastewater.

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Thematic issue: Bioenergy and biorefinery approaches for environmental sustainability

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Environmental sustainability is concerned with our collective responsibility to minimize depletion and deterioration of environmental assets and to support long-time stable ecosystems. Additionally, achieving true sustainability demands that we find a balance between economic development and environmental protection to fulfill the needs of current and future generations. In this respect, ending the severe deterioration of non-renewable resources caused by a sophisticated living environment, combined with a rapidly increasing population, is critical for society and for future generations. Thus, innovative solutions are needed to prevent climate change, including minimizing the use of non-renewable fossil fuels.

Against this overall framing, the substitution of fossil fuel energy with renewable resources of energy such as biomass and its resultant organic waste has been developing more and more as an attractive alternative — driving, additionally, the development of biorefinery systems. These renewable energies will be essential contributions to ensuring global energy security, while also reducing the need for fossil fuel and cutting greenhouse gas emissions. This “green” energy is promising for the environment since it avoids negative effects of the use of fossil fuel energy. Additionally, the use of bioenergy is a viable alternative to fossil fuel energy in areas such as heat supply, and for transportation purposes. Further reasons to support bioenergy are the contributions it would make towards achieving a higher degree of energy security, and the creation of new employment, especially in rural areas.

The International Conference on Green Energy for Environmental Sustainability (ICGEES 2020) is an endeavor to gather concerned professionals to discuss the aspects of green energy for environmental sustainability and to seek solutions wherever possible. The scope of the gathering extends to sustainable biofuels, bionanomaterials and applications, bioenergy policy, biological separation techniques, biorenewable polymers, chemical and biochemical processes, waste biorefineries, biological resources and chemical processes, biomass products for new renewable sources of energy, economic aspects of biomass, environmental management, and bioenergy conversions. The papers presented at this conference were chosen for their scientific rigor and quality to be submitted as a full paper to *Biomass Conversion and Biorefinery*. This thematic issue contains these papers — approved additionally by the journal’s peer-review process.

This thematic issue “Bioenergy and Biorefinery Approaches for Environmental Sustainability” presents therefore articles related to green energy, the use of biomass residues through advanced processes considering system sustainability, bioenergy processes, the energy proficiency of bioenergy systems, bioenergy utilization, biodiversity, and valuation of sustainability, among other topics. The thematic issue contains high-quality research on all other areas of the environment and green energy, including biofuel, energy storage, bioenergy and catalysis for sustainable processes, energy and environmental materials. All papers contained within this issue demonstrate significant improvements and scientific accomplishments; nevertheless, despite these numerous advancements, the field still needs further research. These scientific publications provide a wide collection of new views and innovative ideas.

We want to express our gratitude to the authors as well as the reviewer for their great engagement to compile this comprehensive thematic issue.

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Thermodynamic analysis of single slope solar still using graphite plates and block magnets at seasonal climatic conditions

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ABSTRACT

In this research, the thermodynamic (energy and exergy) analysis of a single slope solar still using graphite plates and block magnets (GPBMSS) was investigated during summer and winter climatic conditions of Coimbatore city (latitude: 11°01'68"N and longitude: 76°95'58"E), in India, 2019. The results observed in GPBMSS were compared with a conventional solar still (CSS) under the same climatic conditions. The outcomes observed that the hourly productivity in GPBMSS was 19.6% and 22.8% higher in summer and winter days, respectively, when compared to CSS. The cumulative productivity in GPBMSS was found to be about 3.93 kg/m² and 3.56 kg/m² respectively, for 12 h observations during summer and winter days. Furthermore, the energy and exergy efficiencies of GPBMSS were substantially improved by 20.6% and 18.1% when compared to CSS during summer days. Similarly, the energy and exergy efficiencies of GPBMSS were increased by 18 and 19% compared to CSS in winter days. In addition, the maximum basin exergy destruction was observed in CSS compared to other solar still components. The results observed that the heat storage ability of the graphite plates and water magnetization in GPBMSS greatly decreased the exergy destructions. Finally, the water quality analysis proved that the distillate collected from both GPBMSS and CSS satisfied the requirements recommended by the Bureau of Indian Standards.

Key words | block magnets, graphite plates, productivity, solar still, thermodynamics

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HIGHLIGHTS

- Graphite plates and block magnets are attached in a solar still basin (GPBMSS) and improved the productivity by 3.93 kg/m² and 3.56 kg/m² respectively, in summer and winter climatic days.
- The energy efficiency of GPBMSS was substantially improved by 20.6 and 18%, respectively, compared to CSS during summer and winter days.
- The exergy efficiency in GPBMSS was enhanced by 18.1 and 19%, respectively compared to CSS in summer and winter days.

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Emission Characteristics of Third Grade Oil Converted Sesame Biodiesel

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ABSTRACT:

The demand and usage of fossil fuels has been increasing drastically, leading us to search for alternate fuels. The sesame seed is selected as an alternate fuel source, as a focus for this research paper. The sesame biodiesel is a type of fuel that has been obtained through the transesterification process from sesame oil using base catalyst transesterification. The sesame biodiesel was blended with four different ratios B10, B20, B30 and B40, among which B20 resulted with better stability, tested in the Kirloskar 240PE VCR engine at a compression ratio of 17.5:1 and 18:1 in various loads. The FTIR test was performed on sesame biodiesel, and it has shown that ester content was present in the test sample confirming its usage as the biodiesel. The fuel properties were found for all the three: sesame oil, sesame biodiesel(B20), diesel and it was found to be within the permissible limit. The result reveals that B20 is the best possible blend that has given good results in emission characteristics. The smoke emission testing was done on AVL emission analyser. It has been noted and observed that there is good reduction in CO, CO₂, and HC than with standard diesel rate at all loads. An increased amount of NO_x is observed as the load increases. It was also noted among the two compression ratios, 18:1 depicted best results considering the emission levels. It is observed that the sesame biodiesel can be used in IC diesel engines with a better outcome than the standard diesel rate. Hence, the work established the need for conversion of sesame seed oil to biodiesel and also suggests that sesame oil could be effectively used as feedstock for biodiesel production.

KEYWORDS:

Biodiesel; Compression; Emission; Sesame oil

CITATION:

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1. Introduction

Sesame oils synthesized from natural raw materials (either of sesame or animal origin) have had a comeback in recent decades. One of the major reasons for the exaggerated utilization of fatty chemicals for industrial use has been their ability to tailor the merchandise to specific needs. A number of the most important areas of applications are in foods, soaps, detergents, cosmetics, prescription drugs, textiles, papers, oil filled chemicals, fat-based emulsifiers, artificial lubricants and metal operating fluids. There are many potential sources of fuels, particularly sesame oils, alcohols such as wood spirit and ethyl alcohol, gases such as compressed fossil fuels, liquified rock oil gas and producer gas etc. Among them, sesame oils are promising, since they are renewable and are made easily in rural areas. Biodiesels are more important due to the depleting fossil fuel resources. The main disadvantage of sesame oil is its high consistency and low volatility that causes poor combustion in diesel engines. To beat this, transesterification method is used as an associate to cut back the consistency of biodiesel to improve the combustion [1]. Transesterification is the method of

removing the glycerides and combining oil esters of sesame oil with alcohol.

Asia ranks sixth in the world in terms of energy demand, accounting for 5% of the world's industrial energy demand. The energy demand is expected to grow at 8% per year. A massive half of India's population, largely in the rural areas, will not have access to it. Hence a program for the event of energy from staple that grows within the rural areas can go a protracted approach in providing energy security to the agricultural individuals. The expansion in energy demand is anticipated to continue because of increasing urbanization, commonplace of living and increasing population. The demand of High Speed Diesel (HSD) is projected to be 52.32 million metric tons in 2010 and is anticipated to grow at 5.6% per year. India's crude production is around 33-34 million metric tons per year even if there will be an increase in gas production of 103 million cuboid meters per day in 2010. Learning from this study, the industrial grade sesame oil was converted into biodiesel. The emission behaviour of test fuels was analysed and the best compression ratio was determined based on the analysis.



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Tensile and shear strength evaluation in joining dissimilar plates of mild steel with aluminum alloy through explosive cladding approach

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Inclination angle

ABSTRACT

Explosive cladding is known for its ability to join a wide variety of metals that other welding methods cannot do. In this present work, the weldability of aluminium alloy and mild steel plates and their bonding strength through an explosive cladding process investigation is performed. Experiments are conducted in the open air using Gelatin (SG-90) variety explosive having a detonation velocity of 3400 m/sec. Experimental trials for single replications were adopted. Ram tensile test has been carried out to determine the bonding strength. The effects of angle of inclination, loading ratio and stand-off distance on the weld strength were analyzed. The possibility of obtaining a sound weld depends on the limiting conditions of the above parameters. The microstructure of the explosive clad joints is studied for varying process parameters which shows a wavy profile that produces higher strength. The strength of the weld in both tensile and shear strength obtained is good and is within the acceptable range. An increase in strength of welded joints is obtained for higher parameter range.

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1. Introduction

Explosive welding is a solid-state welding procedure with a lot of potential for combining dissimilar material combinations with different physical properties, like aluminium to copper, aluminium to carbon steel, and aluminium to stainless steel [1]. The detonation of explosives creates a compression force utilised to attach overlapping metal sheets in explosive welding. Depending on the material and methodology, the joining components are oriented 1–15 degrees toward each other and are prepared with a layer of explosive on top. After ignition, the joining regions are accelerated against each other. Local plastic deformation of the contact area causes continuous joining [2]. Cladding is the process of placing or joining one surface over another surface to build a structure for specific applications [3,4]. The cladding thickness may vary from 0.1 to 30 mm, and the detonation velocity can range from 1200 to 7000 m/s. The top plate hits the bottom plate at 100–1000 m/s speed, with pressures ranging from 10 to 100 kbar. In the contact area, a superheated layer of material forms under

certain conditions. A deformation-induced melting bath then causes the joints [5]. Dilution of the molten zones results in a plane or corrugated interfaces since the melt layer is relatively thin. Explosive welding, unlike surface-layer welding, does not affect the microstructure and corrosion resistance of the layers [6].

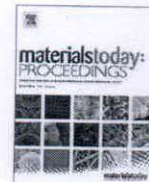
In explosive welding, controlled explosion pressure is used to join two different materials under high pressure. The energy produced by the explosive has been used to accelerate a material (flyer plate) across a predetermined distance (stand-off distance) into contact with another material (base plate) [7]. The resulting composite structure is held together with a complex metallurgical bond. Two plates, the upper one is usually a cladding plate, laid on each other with spacers. The upper plate is then covered with an explosive with a detonator connected to it. When the detonator is activated, an explosion occurs down the length of the workpiece. As a result, the upper plate is pressed down at high speed against the bottom of the common contact point, welding the sheets together. When the explosive is completely consumed, the contact point moves at the same speed and direction as the detonation, and the plates are entirely linked [8]. A jet of metal (from both plates) is ejected ahead of the contact point, clearing any oxide deposits or surface contaminants from the weld surfaces. The pressure at the point of collision would be far higher than the yield strength of

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Biodiesel production from *Capparis spinosa L* seed oil using calcium oxide as a heterogeneous catalyst derived from oyster shell

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Keywords:
Capparis spinosa L
Oyster shell CaO catalyst
Transesterification

ABSTRACT

Increasing fuel prices and depletion of conventional sources of energy has promoted research in non-conventional sources like biodiesel from non-edible seeds and industrial wastes. The present work focuses on the elicitation of biodiesel from the seeds of *capparis spinosa L*. The crude bio-oil extracted from the seeds of *capparis spinosa L* transesterified into biodiesel using calcium oxide as a heterogeneous catalyst derived from oyster shells. The oyster shell powder is characterized before and after calcination using XRD and the calcinated oyster shell is observed through SEM to analyze the size of the particle and morphology. The produced biodiesel was characterized by GC analysis and the fuel properties of biodiesel such as density, flash point, cloud point, pour point and kinematic viscosity, ash content, carbon residue was analyzed and compared with commercial diesel.

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1. Introduction

Rapid modernization and industrial revolution have triggered a considerable increase in energy demand over the past decade. Conventional sources of power, in addition to being nonrenewable, are polluting. The generous rate of industrial growth globally has contributed to the rapid depletion of these conventional sources [1]. This trend is even more pronounced in developing or third-world countries like India and China. Consequentially, these conventional sources are not replenished as fast as they are being depleted. Such a trend would mean that fossil fuels would be fast depleted in the coming years [2]. Therefore, a paradigm shift in the energy source is required so that energy sources that are easily replenished and without the drawbacks of conventional fuels are researched and applied to solve these issues [3,4]. Recent fluctuations in oil prices and the demand-supply gap in fossil fuels have compounded interest in other sources of energy. In this context, the role of biodiesel is well demarcated. Biodiesel is often considered as an alternative fuel option since it provides for the substitution of conventional fossil fuels in existing engines while being negligent in the negative factors associated with commercial fossil fuel products like

diesel. Hence research work on biodiesel has gained momentum in recent years and various sources of biodiesel are evaluated for suitability studies, engine tests and feasible extraction. Furthermore, biodiesel reduces carbon di-oxide emissions during combustion [5].

Biodiesel is generally generated from otherwise unused, waste or discarded biomaterials which are usually easily available. Hence it also has several economic advantages. While considering sources for biodiesel extraction, non-edible sources are usually preferred as they are economical and pose no threat to their primary use of human consumption [6]. In addition, some countries have enacted legislation to prevent the use of edible seeds for biodiesel extraction, to prevent scarcity of the same source as a food source [7]. It is, therefore, recommended to use only those sources which are abundantly available yet generally discarded for biodiesel generation. The same strategy would also promote the farming and cultivation of such crops or seeds and would provide a secondary income to the farmers in the country. In India, the National Policy on Biofuels has outlined a strategy to ensure biodiesel production is only from non-edible sources. Several non-edible seeds are available in India which may be utilized for bio-diesel extraction [8,9]. Caper (*Capparis spinosa L.*), a drought-tolerant plant belonging to genus *Capparis* of the family *Capparidaceae* is mainly distributed in arid and semi-arid regions of the tropical and subtropical world.

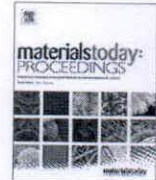
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Sintering parameters consequence on microstructure and hardness of copper alloy prepared by powder metallurgy

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Copper Alloy
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ABSTRACT

In this technical world, the properties and internal structure of materials renders a vital part in building up of the components for various specific purposes and improvise their efficiencies in a better way. The combination of copper with other metals is always an interesting one. In this, brass of grade BS90 is an alloy of zinc added with copper and it is lustrous in nature. The amount of zinc that is mixed with copper can be varied to develop different categories of brass with different melting temperatures that develops distinct electrical and mechanical potency. In the process of better understanding of the powder metallurgy technique and analyzing and improvising the properties of brass, this research is carried out. Primarily, this process is carried out based on the powder metallurgy technique. The prime intention of this investigation is to develop and process the specimens under predetermined conditions of powder metallurgy and then their mechanical hardness and the microstructure are to be characterized. The secondary objective is to analyze these characteristic values and compare them relatively to the specified conditions.

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1. Introduction

Powder metallurgy (PM), one of the earliest technologies is found increasing application allowing close control of tolerances, low scrap losses, complex shape designs, and good reproducibility [1]. The advent of improved atomization techniques for complex alloys has allowed the metallurgical advantages of powder processing over conventional casting and ingot-conversion techniques due to rapid cooling rate observed in a small metal particle as compared to that in an ingot [2]. In PM, uniformity and homogeneity of the microstructure that lends to the powder product desirable mechanical properties with a high degree of reproducibility [3].

Copper and copper alloy powders have been used in industrial applications for many years due to high degree of ductility and toughness at subzero temperatures [4]. Brass could be a metal alloy with a mix of copper and zinc. By changing the quantity of copper and zinc, the softer and harder types of brass can be prepared.

By adding with different metals, the properties of brass can be changed. It will become yellower, stronger, softer, harder, or high corrosion-resistant, relying upon its chemical composition. With increase in zinc content, the strength and malleability of these alloys increases. Bronze is a copper-based alloy with a tin content of around 12%. The alpha primary solid solution of tin in copper is what gives bronze its color. 4–5 percent tin bronze alloys are employed to create springs, blades, turbines and coins [5]. Bronzes are typically very ductile alloys. Bronze is a better conductor of electricity and heat than most steels. Brasses are utilized in applications like coining, blanking, piercing, drawing, fire extinguishers, springs, jewelry, lamp fixtures, radiator cores, ammunition, flexible hose, and the base for gold plate.

Ruzic et al. [6] adopted powder metallurgy process and hardened copper and it alloys and formed various dispersoids deliberated combined and single effect on strengthening mechanism at elevated and room temperature and identified that by thermal aging Cu-Ti compact can be strengthened due to the formation of precipitation and modular structure of $Cu_4Ti_{(m)}$. Wong-Angel et al. [7] improved the mechanical strength of alloy with a composition of 0.3 wt% Mo, 0.6 wt% C, 0.7 wt% Mn and 1 wt% Ni and of Fe

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Synthesis and characterisation of lipase immobilised magnetic nanoparticles and its role as a catalyst in biodiesel production

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Keywords:
Lipase from *Aspergillus Niger*
Magnetic nanoparticles
Microalgal species
Biótransformation reaction

ABSTRACT

We are reporting a rapid, expedient and extracellular method for the synthesis and characterization of lipase immobilized magnetic nanoparticles. This point of view is effortless, financially viable, and steady for a prolonged time, consistent at room temperature. In the present study, an *Aspergillus Niger* (KP001169) fungi were irradiated in the presence of gamma radiation to produce lipase enzyme and then immobilized into Fe₃O₄ nanoparticles. The synthesized Fe₃O₄ nanoparticles were characterized using SEM, XRD and FTIR analytical techniques. The free and immobilised lipase enzyme activity was tested at varied pH and temperature factors. The data suggest that MNPs-Lipase (5 percent) may be reused in biodiesel synthesis without any treatment with a 15 percent loss of activity after five cycles. The optimum reaction conditions were found to be 45 °C, 6 h and 400 rpm.

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1. Introduction

In recent years the researchers gave more interest to the algal fuel production due to the high energy demand and great expenditure of fossil fuels foremost to build-up of greenhouse gases and high CO₂ emission which causes the way for global warming [1]. Microalgae are the more imperative alternative feedstock for the production of biofuel. Further, the most important benefits compared to fossils product, biodiesel has lower emissions of sulphur-based pollutants, aerosols, and carbon monoxide [2,3]. Generally, microalgae can utilize light, carbon dioxide and H₂O for their growth and also mount up intracellular lipids as storage resources [4]. At present the production of biodiesel was passed out by using the transesterification process using caustic chemical catalysts (strong acids or bases) at relatively high temperatures due to their toxicity, lipase has been proposed as a feasible alternative to sodium hydroxide (or) sulphuric acid [5]. The major disadvantages of chemical processes are high energy input, salt removal, glycerol recycling difficulties, and soap generation [6,7]. Enzymatic transesterification was utilised as an alternate technique for biodiesel synthesis to solve these problems. The by-product glycerol

may be easily recovered in this method, and salt and catalyst can be avoided. When compared to other reaction methods, enzymatic transesterification yields a higher yield in gentler circumstances [8]. Lipase enzyme is an environmentally acceptable alternative catalyst for biodiesel synthesis [9-11]. Enzymes catalysts have easily denatured and they have a short catalytic life span and high cost. For this reason, the researchers gave focus towards in immobilizing enzymes on solid supports, allowing reuse of catalyst and also reduce the cost [12]. Re-usage is not the only advantage of enzyme immobilization and also immobilized enzymes can reveal high reaction rates and better thermal steadiness compared with their free enzyme [13]. Microbes, plants, and mammals all generate lipases (triacylglycerol acylhydrolase), with microorganisms being the most appropriate for large-scale manufacturing [14]. The magnetic nanoparticles that were produced were characterised and utilised as a nano-biocatalyst in the synthesis of biodiesel from microalgae as a starting feed material.

2. Material and methods

The chemicals, reagents and media were purchased from SD fine chemicals. The media used for the isolation of fungi from oil contaminated site was Sabouraud Dextrose agar respectively. The chemicals used for staining of fungi was Sudan black B stain, and

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Impact of heating cooling regime on flexural behaviour of self-compacting concrete beams exposed to elevated temperatures

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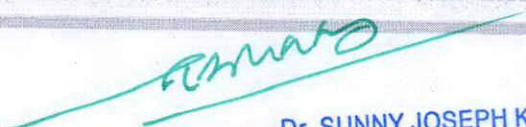
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Abstract

The present study focuses on understanding the impact of the sudden water-cooling method over natural air-cooling method on Self-compacting concrete (SCC) exposed to Elevated temperature. Design mix M25 Grade of SCC was verified by the basic experiments of fresh and hardened properties of concrete. Fresh SCC experiments were conducted based on the guideline of EFNARC. Five SCC beams were cast for experiments and analytical validation. Two different heating methods, along with two cooling methods, were adopted in this study. The experimental results, such as ultimate load and deflection, were validated using finite element analysis with ANSYS. The investigations were extended for SCC beams of different spans with varying cover thicknesses between 25 mm and 60 mm using the validated ANSYS models. It was evaluated from the experimental and analytical investigation that water-cooled specimens exhibited an average of 25% higher load carrying capacity when compared to natural air-cooled specimens. The second method of heating yields 13.76% higher failure flexure load when compared to the first method of heating. The optimum cover to resist the flexure load was 40, 45, and 50 mm for spans of 4.5, 6.0, and 9.0 m, respectively.

Keywords

Self-compacting concrete, Ultimate load, Nominal cover, Elevated temperature,


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Investigation of the Post-Fire Performance and Flexural Behaviour Modeling of FRC Exposed to a Standard Fire

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Abstract

Fibers that are used to enhance the residual flexural and tensile strength of fiber reinforced concrete (FRC) are reinforcing materials possessing good mechanical characteristics and properties. The effect of fiber on the flexural strength of FRC at elevated temperatures is limited and hence the present paper studies the influence of fibers (basalt, carbon, glass, polypropylene, polyvinyl alcohol) on strength grades M20, M30, M40 and M50 concrete specimens exposed to elevated temperature for a duration of 30, 60, 90 and 120 min, respectively, with an ISO 834 fire-curve. The objective of the study is to determine the effect of temperature on the flexural strength of fiber reinforced concrete prism and reinforced concrete beam specimens. Past studies have revealed that concrete's tensile strength is one of the primary factors affected by exposure to higher temperatures, more so than its compressive strength. The residual strength of the specimens was determined after cooling in air, and it was found that carbon fiber reinforced concrete specimens retained more residual flexural strength than the other specimens. The residual energy absorption capacity was analyzed and an empirical relationship was established to find the residual flexural strength in terms of the grade of concrete, the type of fiber and the duration of heating.

Keywords: energy absorption capacity; fiber reinforced concrete; flexural strength; standard fire exposure; cracks

Introduction

Structural concrete is a popularly used construction material in the building industry and its advantages, like durability, high compressive strength, stiffness, ease of molding and non-combustible properties, have made concrete a widely accepted construction material. Although concrete has these advantages, it also has the disadvantage of low strain failure (brittleness) and low tensile strength. It is essential that concrete being used as a material in structural members satisfies some fire safety requirements.¹⁻⁴

Concrete experiences a very steep thermal gradient that degrades the mechanical properties when it is exposed to fire or any extreme temperature. The reason for the strength reduction of concrete at high temperatures is chemical and physical degradation (spalling), which takes place at high temperatures. The mechanical properties of concrete are highly influenced by its hydration products like calcium silicate, calcium hydroxide,

etc., which are formed when cement reacts with water. A considerable dehydration process (ettringite and monosulphate) takes place within the concrete when it is exposed to temperatures above 100°C.⁵ At low elevated temperatures (less than 300°C), free water molecules within the cement matrix are removed by evaporation. With the increase in temperature, CSH gel disintegrates inside the concrete and chemically bonded water is released from the matrix. This change occurs within the concrete and thus affects the pore structure, which leads to crack formation and spalling. An elevated temperature weakens the bond between aggregate and binder making the concrete vulnerable to spalling.^{6,7} The internal water pressure increases above 300°C leading to internal tensile stresses, which, when they exceed the allowable stress, form cracks.^{4,8} The temperature distribution within the concrete and the development of vapor pressure are the two prime factors leading to thermal instability and strength degradation.^{9,10}

Demand for fiber reinforced concrete (FRC) has been very high in recent years as this material is utilized for developing high performance concrete. The addition of fiber in the concrete improves impact resistance, fire resistance, strength and the interfacial bonding of the cement matrix.¹¹⁻¹³ The tensile strength of concrete can be improved with suitable control (quantity) of addition of fiber, as it has a crack arresting nature and creates small voids and cavities when heated thereby helping to release the internal stresses formed within the concrete, thus improving its fire resistance.^{5,14} It is evident that, when concrete is exposed to higher temperatures, its flexural strength decreases owing to the evaporation of water and weight loss, resulting in the formation of cracks. There is limited literature addressing the flexural behavior of FRC when exposed to higher temperatures.^{15,16}

For this reason, the present authors conducted research on the residual strength of higher performance concrete with and without polypropylene (PP) fibers at elevated temperatures using a computerized electric furnace in accordance with the ISO-834 fire-curve. It was observed that there was no explosive spalling for concrete with PP fibers during the fire test, but concrete specimens without fiber exhibited spalling damage.¹⁷ In Refs. [18,19] the authors have reported that the addition of discrete short fibers in concrete was found to be beneficial and effective in preventing the propagation of cracks. Fibers have been widely used to enhance the ductility of concrete.^{20,21}

Ref. [22] explained that the fibers are used in concrete to increase the energy absorption capacity and toughness of concrete, and the addition of fibers also helps to reduce the density of cracks in concrete. Ref. [23] reported that some synthetic fibers improve the

Article

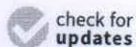
Automated Detection and Classification of Meningioma Tumor from MR Images Using Sea Lion Optimization and Deep Learning Models

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Abstract: Meningiomas are the most prevalent benign intracranial life-threatening brain tumors, with a life expectancy of a few months in the later stages, so this type of tumor in the brain image should be recognized and detected efficiently. The source of meningiomas is unknown. Radiation exposure, particularly during childhood, is the sole recognized environmental risk factor for meningiomas. The imaging technique of magnetic resonance imaging (MRI) is commonly used to detect most tumor forms as it is a non-invasive and painless method. This study introduces a CNN-HHO integrated automated identification model, which makes use of SeaLion optimization methods for improving overall network optimization. In addition to these techniques, various CNN models such as Resnet, VGG, and DenseNet have been utilized to give an overall influence of CNN with SeaLion in each methodology. Each model is tested on our benchmark dataset for accuracy, specificity, dice coefficient, MCC, and sensitivity, with DenseNet outperforming the other models with a precision of 98%. The proposed methods outperform existing alternatives in the detection of brain tumors, according to the existing experimental findings.

Keywords: convolutional neural network (CNN); boosted anisotropic diffusion filter; modified K-means clustering; magnetic resonance imaging; meningioma; sealion optimization



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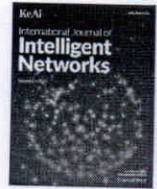


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1. Introduction

The brain tumor and its analysis are of tremendous interest because of the growing innovations in medical image processing. An abnormal tissue development within the brain causes a tumor. According to the National Brain Tumor Foundation's (NBTF) global review, the improvement of brain tumor diagnoses among patients and the death rate due to brain tumors are outpacing earlier years' findings clinical experts can give patients more effective e-health care services, thanks to developments in medical imaging for this enhancement [1]. E-health care systems have a wide range of applications in medicine [2]. Due to their high accuracy and efficient results as presented by the radiologist, computer-vision-based biomedical imaging systems have gained appeal among clinical specialists, allowing them to handle treatment-related concerns more efficiently. Positron emission tomography (PET), magnetic resonance imaging (MRI), and computed tomography (CT) are the most popular modalities used to examine a brain tumor [3]. Magnetic resonance imaging (MRI) is well-known medical equipment that can be used to diagnose and study a variety of disorders, including brain tumors, neurological ailments, and epilepsy, among others. Typically, a system that is entirely processed by hardware/computer aids in the automation of this process, in order to produce correct and timely results. Machine learning (particularly deep learning) improvements have made it easier to discover, classify, and measure trends in medical images.


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AARIN: Affordable, accurate, reliable and innovative mechanism to protect a medical cyber-physical system using blockchain technology

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ABSTRACT

The enhancement (in the past decade) in electronics devices/technology, a rise in most of the accidents concerning security and surveillance intruding the private lives of the users question the existing systems being used to combat this challenge wherein, the third-parties gather and handle large amounts of individual details. As part of the constant evolution of the cyber physical system architecture, one of the goals of our system is to reduce the latency time for enrollment of new information. Generally, the efficiency and benefit of a Cyber Physical Systems (CPS) depends heavily on interconnection of individual devices or nodes. Exchange of data and information relevant to an overall task or functionality is the key to many applications such as smart grids, smart cities, and many others. Trustworthiness of data is needed to make such systems (especially in MCPS systems) successful. To be able to fulfill policies to guarantee the safety of all entities within a Medical Cyber Physical Systems (MCPS) and to provide security measures to enforce these cryptographic solutions have to be embedded. This paper describes a decentralized e-healthcare application framework for personal data management that ensures that users own and access their data. This work proposes a novel mechanism to secure Medical Cyber Physical Systems (MCPS), i.e., as an automated access-control manager (including building trust in a third party). This work also integrates some features in security building blocks in ultra-small devices to provide essential properties to secure embedded systems.

1. Introduction – cyber physical system

Bitcoin has introduced a new technology to provide security with a higher degree of trust using decentralized and distributed concepts [1]. Today the same technology (i.e., Blockchain technology) is used in various applications like creating new cryptocurrency, finance or smart contract, auditable computing, etc. To overcome lack of security issues in the available cyber physical system, Organizations/Government may use Blockchain as a game changer. In general, there are several types of cyber physical systems (build with the combination of physical and cyber space), which are included as: Industrial Control System CPS, Smart Grid CPS, Medical CPS, Smart Cars/Automotive CPS, Household CPS, Aerospace CPS, Defense CPS.

These CPSs are built through interconnection of Internet of Things

(IoTs) together, i.e., on a large scale. High levels of security and stringent measures to prevent unnecessary breaches of data can be acquired by using digitally verified birth certificates which cannot be manipulated or time stamped and is inaccessible to all people. Blockchain technology tries to solve above raised issues but we need to ask one question here: "What challenges do we currently face in our transaction networks?" Let's consider the case wherein the absence of the essential element of trust leads to friction. This can be easily solved in the presence of Blockchain, as the shared ledger it implements helps in enhancing the transparency of transactions, thus improving trust. If business agreements or make delays (in providing of services), smart contracts may be the solution. The aim in this present study is to determine "how Blockchain can help overcome specific challenges"? As discussed, the first widely known and discussed Blockchain was the Bitcoin Blockchain [1], and it serves as the de-facto

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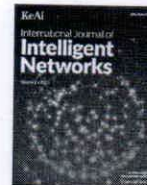
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Autonomous Intelligent Vehicles (AIV): Research statements, open issues, challenges and road for future

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ABSTRACT

The vehicle business has accomplished extraordinary outcomes in creating dependable, sheltered and reasonable vehicles throughout the only remaining century. Autonomous Vehicles (AV) are turning into a reality due to generous late improvements in Internet of Things (IoTs), Programmable Logic Controller (PLC) and correspondence innovations in computing filed. Notice that self-sufficient vehicles here are for vehicles just including transports, light vehicles, and so forth Model models have now voyaged a huge number of miles in test driving for self-ruling vehicles (under self-sufficient vehicles). This isn't a final attempt to self-governing vehicles; we have to plan Autonomous Intelligent Vehicles (AIV) that can make a compelling (for example, without hurting people) choice over the street organization. Later on, self-governing vehicles will be a reality, in any event, for commercialization, as by and by. In AIV, we face various specialized and non-specialized issues, for example, programming multifaceted nature, constant information examination and testing and confirmation. Handling these issues requires viable and prompt arrangements that meet the prerequisites, guidelines and strategies of clients, industry and government. The analysis of this work will help numerous research analysts who work in Autonomous Vehicles or Intelligent Transport Systems today and so on in near future to get better solution.

1. Introduction

Vehicles have made unmatched steps in the car business and data innovation, changing the traditional car from a good old wellspring of transport into a full-scale (moving/voyaging) gadget and driving framework wealthy in infotainment. The presentation of very good quality vehicles today gives the premise to the acknowledgment of clever vehicles in numerous fields, for example, medical services, coordination's, and so forth These keen vehicles are self-governing (driverless) in that they underwrite attributes, for example, detecting the world, settling on quick and opportune choices, exploring out and about without human info, keeping up secure examples of portability, playing out a wide range of moves, and to give some examples, journey control. Autonomous Intelligent Vehicles (AIV) has been alluded to as such vehicles. A self-ruling astute vehicle alludes to a PC controlled vehicle that, with no human intercession, can guide itself, acclimate itself with the climate, decide, and work totally [1–3]. Self-governing vehicles [1,2] are fundamentally worried about: wiping out driver needs, inferable from monstrous populace development, extending foundation, expanding the

quantity of vehicles, the requirement for fruitful time the executives, and the usage and enhancement of assets. This stressfully affects our transportation framework as the human populace extends and the quantity of vehicles increments, going from streets and parking spots to fuel stations (for vehicles with fuel motors) and charging stations (for electric and cross breed vehicles). There are several smart applications exist in current which can be depicted as Fig. 1.

In Fig. 1, we can find out unmanned aerial vehicle are the example/type of intelligent transportation systems.

Autonomous vehicles are considered as potential vehicles and referred to as Vehicles of Tomorrow (or Internet of Vehicles (IoV)) as sub-components of Autonomous Intelligent Vehicles. Remember that the vehicles of tomorrow are autonomous vehicles, the Internet of Vehicles, electric vehicles, hybrid electric vehicles. We have seen tremendous improvements in transport or in the field of vehicles in the previous century (or years) (refer Fig. 2). In the transportation field, we have seen many significant fatalities in the past decade. We are counting/having more millions of road accidents around the world; many people are losing their lives as a result. The number of deaths is rising year by year

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A Novel Approach to White Light Radiation from Silicon Based Tunnel Junction LEDs

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Abstract

This paper examines another kind of white light radiating half and half diode, made out of a light producing GaN/InGaN LED and a layer of semiconductor nanocrystals for shading transformation. In contrast to standard white LEDs, the gadget is arranged to accomplish high shading transformation effectiveness by means of non-radiative vitality move from the essential LED to the nanocrystals. Driven structures with sub-10 nm partition the between quantum well and the surface and designed standard brilliant LEDs are considered for the half and half gadgets, which require closeness of the nanocrystals to the quantum well. The advancement of the cross breed diode creation counting process methods for GaN LED and joining of the nanocrystals are given the accentuation on the distinctions with standard LED preparing. Results and investigation of optical and electrical portrayal counting photoluminescence (PL), smaller scale PL, time-settled PL and electroluminescence (EL) together with current-voltage qualities are exhibited to assess the gadget execution. An away form of non-radiative vitality move was found in the transporter elements of both the LED and the nanocrystals when the quantum well – nanocrystals partition was under 10 nm. Examination of the outcomes shows that in request to accomplish adequate for the white LED shading transformation, better surface passivation and nanocrystals with shorter exciton lifetimes and more vulnerable auger recombination are required.

Keywords GaN · LEDs · Tunnel junction · Droop · MQW

1 Introduction

A striking advancement inside the field of light-discharging diodes (LEDs) has been accomplished during the previous a very long while. LEDs became ground-breaking and simultaneously vitality effective, with an assortment of distinctive discharge wavelengths from UV and violet (AlGaIn and InGaN based) to dark red (in view of GaP and its sets of three) single wavelength diodes, just as multicolor and white LEDs [1, 2]. This innovation has formed into strong state lighting (SSL), dislodging other light sources after some time and along these lines pulling in immense consideration from the clients and makers. The makers were willing to improve nature of white LEDs and cut its manufacture costs utilizing new advancements, so as to make LEDs progressively alluring for the clients.

Despite the fact that white LEDs are broadly utilized now, both their significant expense also, somewhat more awful shading rendering contrasted with the customary bulbs push innovation to imagine and create better and less expensive gadgets by finding new ways, arrangements and materials. The greater part of as of now accessible white LEDs are based

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THE VERTEX DISTANCE COMPLEMENT SPECTRUM OF SUBDIVISION VERTEX JOIN AND SUBDIVISION EDGE JOIN OF TWO REGULAR GRAPHS

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Abstract: The vertex distance complement (VDC) matrix C , of a connected graph G with vertex set consisting of n vertices, is a real symmetric matrix $[c_{ij}]$ that takes the value $n - d_{ij}$ where d_{ij} is the distance between the vertices v_i and v_j of G for $i \neq j$ and 0 otherwise. The vertex distance complement spectrum of the subdivision vertex join, $G_1 \vee G_2$ and the subdivision edge join $G_1 \underline{\vee} G_2$ of regular graphs G_1 and G_2 in terms of the adjacency spectrum are determined in this paper.

Keywords: Distance matrix, Vertex distance complement spectrum, Subdivision vertex join, Subdivision edge join.

1. Introduction

Spectral graph theory deals with the study of the eigenvalues of various matrices associated with graphs. Initially, the spectrum of the adjacency matrix of a graph was studied. Collatz and Sinogowitz initiated the exploration of this topic in 1957 [2]. Since then spectral theory of graphs is an active research area [1, 3].

In this paper, we consider the matrix derived from a type of distance matrix, viz., vertex distance complement (VDC) matrix. The VDC spectra of some classes of graphs are found in [8, 9]. The VDC matrix C of a graph G [7] is defined as follows

$$C = \begin{cases} n - d_{ij}, & i \neq j, \\ 0, & i = j, \end{cases}$$

where d_{ij} is the distance between the vertices v_i and v_j of G and n denotes the number of vertices of G .

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Performance improvement for metro passenger flow forecast using spatio-temporal deep neural network

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Abstract

In the field of transportation planning and management, passenger flow analysis is a significant problem with a wide range of applications. The prediction performance of forecast models is hence cardinal to any software analytic system. A predominant source of metro data is the automated fare card (AFC) system from which it is possible to gather a tremendous amount of information connected to passenger flow. Passenger flow represents a process whose dynamics are highly stochastic and dependent on a number of extrinsic and intrinsic parameters. This paper presents a restricted and simple model to study the intrinsic statistical influences governing the dynamics. These influences are either spatial or temporal. The feature space in which analysis algorithms run will be more effective if there is a collation of information from both spatial and temporal dimensions. The passenger flow parameter is fed into the layers of the deep neural network using the ST-LSTM (Spatio-Temporal Long Short-Term Memory) architecture. The architecture is evaluated with passenger movement data collected from the AFC information from the Kochi metro rail. To reduce the impact of irregular flow, the design uses the SVM-based outlier detection and elimination algorithm. A higher precision has been reached by the approach in comparison with SVR, ANN, LSTM algorithms.

Keywords Passenger flow forecast · Spatio-temporal LSTM · Outlier detection

1 Introduction

Passenger flow forecast is an integral part of efficient transportation management. Passenger flow is highly stochastic in nature and affected by a wide spectrum of intrinsic and extrinsic factors. Hence modeling of passenger flow to make predictions is a complex process and needs effective adaptive systems. The intrinsic influential parameters can be spatial or temporal. Spatial influences are primarily the location of the stations and passenger flow in the proximate stations. Temporal influences are primarily intra-sequential statistical dependencies between

consecutive flow observations. The proper combination of both aspects is decisive in the ultimate performance of the system. This work proposes a novel way to bring the two influences together to generate an intermediate feature space using a Recurrent Neural Network.

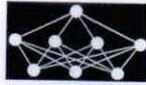
The passenger flow used to be modelled using Linear Regression from the beginning of forecasting models. The regression works well with data which follows linear relations. But in most of the real-world patterns follow a complex structure making linear models insufficient. Passenger flow pattern has nonlinear temporal dependencies. In this case, the regression models like linear regression, support vector regression with linear kernel and ARMA are not suitable as reported in [10].

The nonlinearity problem can be solved by SVR with hand engineered features, but the result comparison shows a sub-optimal performance after comparison with neural architectures. NN offer the degrees of freedom required for adapting to the complexity at hand. For instance, [21]

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PASSENGER FLOW PREDICTION FROM AFC DATA USING STATION MEMORIZING LSTM FOR METRO RAIL SYSTEMS

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Abstract: Metro rail systems are increasingly becoming relevant and inevitable in the context of rising demand for sustainable transportation methods. Metros are therefore going to have a consistently expanding user-base and hence user satisfaction will require meticulous planning. Usage forecast is clearly an integral component of metro planning as it enables forward looking and efficient allocation of resources leading to greater commuter satisfaction. An observation from studying the usage of Kochi Metro Rail Ltd. is that there is a consistently occurring temporal pattern in usage for every station. But the patterns differ from station to station. This hinders the search for a global model representing all stations. We propose a way to overcome this by using station memorizing Long Short-Term Memory (LSTM) which takes in stations in encoded form as input along with usage sequence of stations. This is observed to significantly improve the performance of the model. The proposed architecture with station parameter is compared with algorithms like SVR (support vector regression) and neural network implementation with the best architecture to testify the claim. The proposed model can predict the future flow with an error rate of 0.00127 MSE (mean squared error), which is better than the other models tested.

Key words: *metro rail transport, forecast, passenger flow, LSTM*

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1. Introduction

Metros are increasingly becoming a part and parcel of modern transportation systems within highly populated and geographically large cities [22, 14]. It reduces

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An overview of security issues in Internet of Things based smart environments

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Abstract

Wireless Sensor Network (WSN) and Internet of Things (IoT) together have the potential to change the whole world into a smart planet. IoT technology has been a huge boon for a clean, green, and sustainable environment. This technology benefits numerous industries by improving connectivity and reducing energy wastage. IoT has the potential to make our environment more sustainable and help us to reduce pollution all across the globe. But due to limited resources in both these networks, it is very challenging to form a complete secure system. This survey paper examines the various security requirements and attacks possible in WSN and IoT. The paper surveys existing approaches like blockchain, fog/edge computing and machine learning to ensure security of IoT systems. The paper also evaluates the performance of common machine learning algorithms using IoT datasets.

Keywords: wireless sensor networks, Internet of Things, security threats, blockchain, fog computing, edge computing, machine learning.

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1. Introduction

WSNs consist of several sensor devices with sensing, computation, and wireless communication capabilities [1]. The network is usually composed of numerous wireless sensor nodes and a sink node. These nodes have limited storage and computational capabilities [2]. They are also limited in bandwidth and power. In order to collect the required data, these sensors become active when something is detected and then remain mostly idle for long periods of time. The nodes sense a physical phenomenon from the environment and then transfer the sensed data to the sink node. The idea of IoT was developed in parallel to WSNs. WSNs can be considered as a subset of IoT as the wireless sensor nodes can have internet access capabilities. In the case of an IoT system, all of the sensors directly send their data to the internet. Any device that connects to the internet can be considered

an IoT device. By the year 2022, the total number of wireless sensors deployed is expected to reach 60 trillion [3]. WSNs and IoT systems can be used to monitor wildfire, earthquake, ocean, pollution, water quality, wildlife etc. and also can be used in human-related activities like military operations [4].

IoT has revolutionized the world and it has made very cost effective and efficient solutions in different areas [5]. Kevin Ashton introduced the concept of IoT in 1999 with reference to the supply chain management [6]. The “things or devices” in IoT are smart and uniquely addressable based on their communication protocols. An IP address is assigned to these devices so that they can send and receive data over a network. By the year 2025, IoT market is likely to grow to more than 75 billion devices. IoT is believed to have a dramatic impact on our lives and WSNs will be integrated into it. The vision behind IoT is to connect people and smart things at any time and in any place through any communication

Biodegradation of P-nitro phenol using a novel bacterium *Achromobacter denitrificans* isolated from industrial effluent water

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ABSTRACT

In the present investigation, *Achromobacter denitrificans* was isolated from industrial wastewater and used in the degradation of para nitro-phenol. Experiments were made as a function of different carbon sources, organic and inorganic nitrogen sources and metal ions to analyse the removal efficiency of para nitro-phenol present in the industrial wastewater sources. Observations revealed that the rate of phenol biodegradation was significantly affected by pH, temperature of incubation, glucose, peptone and metal ion concentration. The optimal conditions for phenol removal were found to be pH of 7.5, temperature, 35 °C and 0.25 gL⁻¹ supplemented glucose level, 0.25 gL⁻¹ supplemented peptone level, and 0.01 gL⁻¹ zinc ion. The key importance of the present study is the utilization of a native bacterial strain isolated from the industrial effluent water itself having an impending role in the bioremediation process of phenol.

Key words: *Achromobacter denitrificans*, bacterial strain, pH, phenol degradation

HIGHLIGHTS

- *Achromobacter denitrificans* was isolated from industrial wastewater.
- Experiments were made as a function of different carbon sources, organic and inorganic nitrogen sources and metal ions.
- Observations revealed that the rate of phenol biodegradation was significantly affected by pH, and temperature of incubation.

INTRODUCTION

In the past few decades, the rapid increase in the population and industrialization development has resulted in environmental pollutants in air, soil and water. Recently, various chemical industries have developed and during the processing of dyes, pharmaceuticals resins, varnishes, plastics, and pesticides (Sun *et al.* 2015). According to the Environmental Protection Agency, if the phenol concentrations are greater than the 1.0 ppb level they are toxic to all kinds of living organisms (Kazemi *et al.* 2014). Nowadays agro-chemical industries play a major role all over the world, releasing phenolic compounds and creating serious environmental pollution (Mohammadi *et al.* 2015). Generally, phenol compounds are classified into several types; among the various types, nitro-substituted phenol is the most serious pollutant contaminant compound in industrial wastewater, which causes serious ecological impact in the environment. P-nitro phenol has been listed in priority pollutants by the US EPA (United States Environmental Protection Agency 1992) which recommends the concentration of phenol in natural water should be <10 mg/L. The exposure of P-nitro phenol could lead to skin and eye irritation, kidney damage, liver malfunction, and systematic poisoning (Kulkarni & Kaware 2013). The microbial resistance enhances with the nitro group of PNP, which favors bio-degradation. However, several methods are used for the removal of phenol present in water and soil sources, but bio-remediation is more cost effective and economical (Mukherjee *et al.* 2013). In the past decades, several studies have been done on bioremediation of phenol using strains like *Arthobacter*, *Rhodobacter*, *Bacillus*, *Burkholderia*, *Pseudomonas* etc. that have the ability to utilize P-nitro phenol as a carbon and nitrogen source (Yanase *et al.* 1992;

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An elitist control scheme for power flow management in smart grid system: a hybrid optimization scheme

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ABSTRACT

In this manuscript, an elitist power flow management (PFM) scheme of PV/FC/battery/SCAP in smart grid (SG) system is proposed. The proposed structure has photovoltaic (PV) generator (Maximum Power Point Tracking (MPPT) and power limitation mode), battery storage, fuel cell (FC), and super capacitor (SCAP). The proposed method is the consolidation of binary adaptation of ant lion optimizer (BALO) and squirrel search optimizer (SSO), and hence it is known BALS0 method. Here, BALO is generated the inverter control pulses depends on power transfer an assortments among source and load side. The formulation of multiobjective function in terms of available source power through grid required generated active with reactive power variety. Here, SSO is utilized to obtain that online control pulse using power flow varieties. Moreover, a power flow management method as per the global state of charge (SOC) of energy storage and load demand is proposed. Finally, the BALS0 system is performed on MATLAB/Simulink work site. The efficiency of the BALS0 system is analyzed through other existing systems. The elapsed time with proposed and existing technique is evaluated.

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optimizer

Introduction

A Microgrid (MG) is a significant role of energy management. The distributed energy management is smooth combination and loads performance with energy storage devices at local sector. To increase the energy sources incursion, storage and load compatible with direct current, the direct current focused toward it. By comparing alternating current (AC) and direct current (DC) MGs exhibits certain advantages owing to power conversion (a) distributed generations with loads (PV, FC, energy storage system), electrolyzes, charge piles, Light Emitting Diode, which is linked without AC/DC conversion, their performance and stability intensify. Over the last few years, PV, energy storage systems (ESSs), FCs, DC loads into the traditional power systems via DC microgrid (MGs). Then again, wind turbines, AC loads might be associated with the power systems via AC MGs. AC and DC MGs including power resources of AC, DC, and loads are called as hybrid MGs in the future SGs (Lin et al. 2019; Mythili et al. 2020). The AC/DC MGs have been interlinked via power converters are also considered. Where, this association helps MGs trade power required. Typically, the power converters associated on

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Machine Learning for Modeling and Control of Industrial Clarifier Process

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Abstract: In sugar production, model parameter estimation and controller tuning of the nonlinear clarification process are major concerns. Because the sugar industry's clarification process is difficult and nonlinear, obtaining the exact model using identification methods is critical. For regulating the clarification process and identifying the model parameters, this work presents a state transition algorithm (STA). First, the model parameters for the clarifier are estimated using the normal system identification process. The STA is then utilized to improve the accuracy of the system parameters that have been identified. Metaheuristic algorithms such as Genetic Algorithm (GA), Particle Swarm Optimization (PSO), and State Transition Algorithm are used to evaluate the most accurate model generated by the algorithms. By capturing the principal dynamic features of the process, the clarifier model produced from State Transition Algorithm (STA) acts more like the actual clarifier process. According to the findings, the controllers provided in this paper may be used to achieve greater performance than the standard controller design during the control of any nonlinear procedure, and STA is extremely helpful in modeling a nonlinear process.

Keywords: Sugar industry; clarifier process; pH neutralization; system identification; genetic algorithm; particle swarm optimization; state transition algorithm

1 Introduction

The main and basic requirement of sugar processing is a quality product with an acceptable economic benefit. The various stages are involved in modern technology to prepare sugar, whereas; clarification is the key part to ensure the quality of the product. Additionally, the clarification process of sugar industry influences the fundamental properties like pH, crystallization, drying, etc. It is necessary to control the pH to attain the quality outcome which can be succeeded with proper modeling of the process. The cane stalk processing in sugar industry makes affects the quality of raw sugar and clarification process efficiency and performances [1-3]. Due to the lower quality of clarified juice, the evaporation process is



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