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3rd INTERNATIONAL KARATEKIN SCIENCE AND TECHNOLOGY CONFERENCE

21-22 November 2024

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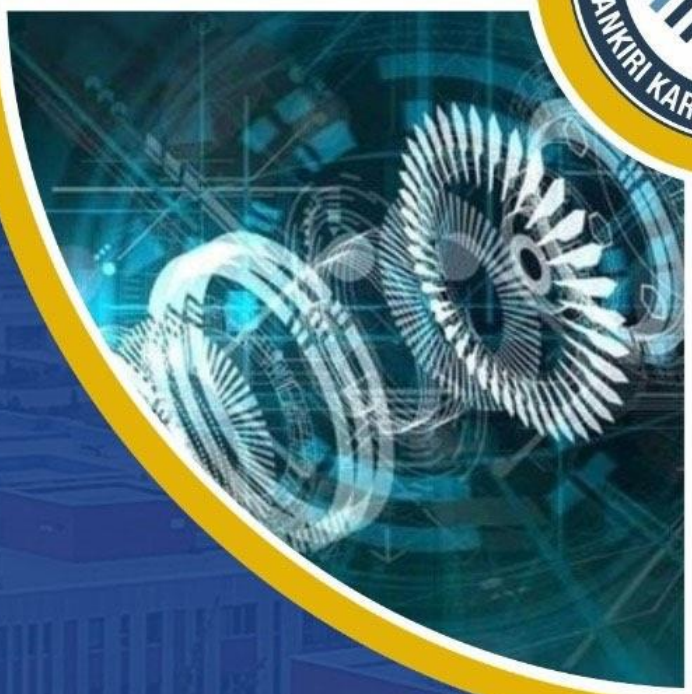

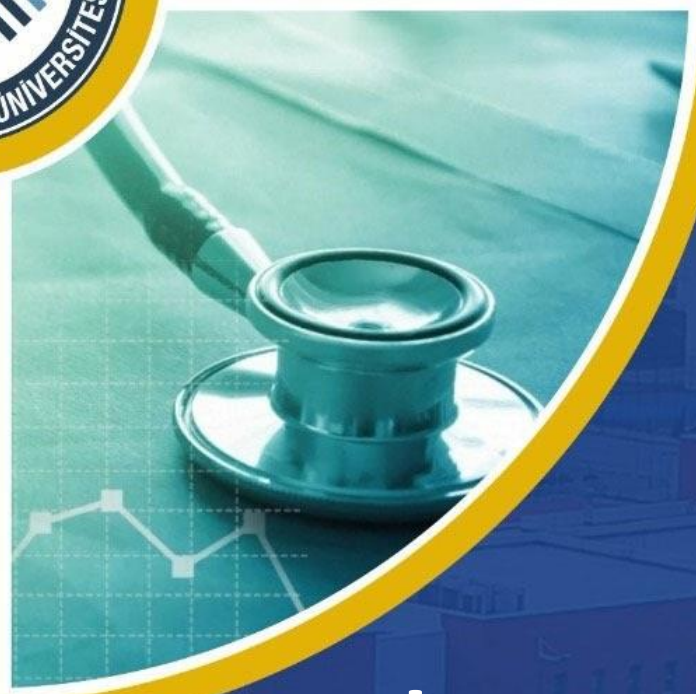

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3rd International Karatekin Science and Technology Conference

(IKSTC3rd)

ABSTRACT PROCEEDING BOOK

November 21-22, 2024 – Çankırı, Turkiye

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ABOUT THE CONFERENCE

CONFERENCE NAME

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DATE AND PLACE

November 21-22, 2024 Çankırı – Turkiye

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Landscape Architecture
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Material Science
Metallurgy and Materials Engineering
Mechanical Engineering
Medicinal Science
Occupational Health and Safety
Physics
Statistics

Dear Participant,

The total number of speakers at "3rd International Karatekin Science and Technology Conference" was 84 together with the invited speakers.

A total of 9 invited speakers, 3 of whom are foreign and 6 of whom are Turkish nationals, made presentations at the conference.

In addition to the invited speakers, 45 foreign speakers from various countries made presentations at the conference. 54% of the 84 speakers in total were foreigners.

Thank you to all the participants who gave generously of their time, especially the speakers who shared their studies and experiences and the institutions who assisted in.

3rd International Karatekin Science
and Technology Conference
Organizing Committee

T.C.
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Genel Sekreterlik

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Üniversitemiz ev sahipliğinde 21–22 Kasım 2024 tarihleri arasında yüz yüze ve çevrimiçi (hibrit) olarak düzenlenecek olan 3. Uluslararası Karatekin Bilim ve Teknoloji Konferansına (3. International Karatekin Science and Technology ConferanceIKSTC3rd), Fen Fakültesi Kimya Bölümü öğretim üyesi Prof. Dr. Şevki ADEM'in "Konferans Akademisyen Temsilcisi" olarak katılım sağlaması Rektörlüğümüzce uygun görülmüştür.

Bilgilerini ve gereğini rica ederim.

Prof. Dr. Harun ÇİFTÇİ
Rektör

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3rd International Karatekin Science and Technology Conference

IKSTC3rd 2024

November 21-22, 2024 – Çankırı, Turkiye

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A NOVEL TOOL FOR MASS-BASED BIO(SENSOR) APPLICATIONS: QUARTZ TUNING FORKS

INVITED SPEAKER

Mustafa Kemal Sezgintürk*
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ABSTRACT

Disposable electrodes are the latest innovation in electrochemical biosensing systems, providing a new level of reproducibility and ease of use. They are less expensive than conventional, non-disposable electrodes and can be replaced more often without electrode reconditioning by polishing and other methods. More frequent replacement of working electrodes results in more predictable and reproducible electrochemical detection. In addition, the use of disposable electrodes can simplify troubleshooting. These kinds of electrodes also make it possible to immobilize biological materials as bioreceptors onto their surface effectively. Moreover, disposable electrode materials have important advantages such as low cost, good repeatability and reproducibility, acceptable linear determination ranges.

QTF (Quartz Tuning Fork) sensors have become popular in recent years and can be used as temperature, humidity, pressure and, most importantly as biosensors. Since there are no commercially available devices that can use QTF sensors, their widespread use is limited. Biosensors based on quartz tuning forks are often used in medical and environmental applications, such as in monitoring the stiffness of blood vessels, detecting changes in the viscosity of blood, or measuring the concentration of certain biomolecules in a sample. These sensors can provide highly sensitive and accurate measurements, and are often used in combination with other detection methods for improved sensitivity and specificity [1-3].

QTF based biosensing systems have been developed for different biological relevant targets with all of their electronically devices by our research groups. In this work, these QTF based biosensing systems are presented with their fabrication steps and optimization and characterization parameters. Following this, the advantages and disadvantages of the system are discussed with the future perspectives.

Acknowledgements
The author would like to acknowledge the financial supports from TÜBİTAK, ÇOMÜ-BAP, and AÜ-BAP.

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[3] F. Arı, B. İnce, M. A. Ünal, et al. A novel electrochemical approach to biosensing applications: Quartz tuning forks as working electrodes for immunosensors. Micro. Chim. Acta 195 (2023) 109484.

Keywords: QTF, Quartz Tuning Fork, Biosensor

POWETRAIN AND MECHATRONIC SYSTEM IN ELECTRIC VEHICLES

INVITED SPEAKER

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ABSTRACT

Electric vehicles are experiencing a significant increase in popularity, driven in part by their more environmentally friendly nature compared to traditional combustion engine vehicles. However, a key catalyst for this popularity is the constant improvement of electric vehicle technologies, making them more efficient, reliable and cost-effective.

A key factor contributing to this progress is the powertrain and propulsion system of electric vehicles, components that often remain unexplored by many.

The powertrain and mechatronic systems in electric vehicles have seen significant progress in recent years.

Drive systems integrate gears, clutches and other mechanical components with drive motors and motor controllers and affect EV performance.

Innovations in engine design and materials, advanced control strategies and algorithms, and integration with renewable energy sources are helping EV progress. However, there are still many challenges, such as reducing the production costs of electric vehicles, increasing the driving range and optimizing the charging infrastructure. As these areas develop, electric vehicles will play an increasingly important role in the transportation system.

Keywords: Electric vehicles, Powertrain system, Mechatronic system

INVESTIGATION OF INHIBITORY EFFECTS OF SYNTHETIC POLYMERS ON CALCIUM OXALATE CRYSTALS FORMATION

INVITED SPEAKER

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ABSTRACT

The formation of calcium oxalate (CaOx) crystals is a major issue in various fields, including medicine and industrial processes. The inhibition of crystal formation is crucial for optimal equipment performance and to prevent related issues such as kidney stone problems. In this study, we aimed to investigate the inhibitory effects of natural and synthetic polymers on CaOx crystal growth. Firstly, we examined the effects of natural polymers, pectin, and sodium alginate, on CaOx crystal growth, and found that both polymers significantly inhibited crystal growth, with the highest inhibition observed at 10 ppm concentration. While pectin did not affect crystal size, sodium alginate reduced crystal size with increasing concentration. Secondly, we investigated the inhibitory effects of synthetic polymers, polyacrylic acid (PAA), and polyacrylic acid sodium salt (PAANa), on CaOx crystal formation. Both polymers were found to be effective inhibitors, with PAA inhibiting crystal formation by 50-90%, and PAANa inhibiting formation by 95-98%. These findings suggest that these natural and synthetic polymers have the potential to serve as non-toxic inhibitors of CaOx crystal growth, which could prevent various industrial problems and kidney stone formation. This study contributes to the understanding of the fundamental principles underlying CaOx crystal formation and the potential use of polymers as inhibitors.

Keywords: Calcium oxalate, inhibitors, pectin, sodium alginate, polyacrylic acid, polyacrylic acid sodium salt, kidney stones.

NDWI ANALYSIS FOR DETECTION OF WATER BODY EXRACTION OF BEYSEHIR LAKE BETWEEN 1984-2024

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ABSTRACT

This study investigates the long-term changes in the water surface area of Beyşehir Lake, the largest freshwater lake in Türkiye, between 1984 and 2024. Using Landsat satellite images and the Normalized Difference Water Index (NDWI), we analyze decade-interval data to monitor changes in the lake's surface area in response to climate-driven water resource pressures. Our findings show a significant decline in the lake's surface area from 658 km² in 1984 to 581 km² in 2024, marking an 11.7% reduction. This shrinkage is attributed to increased drought conditions linked to climate change, impacting local agriculture and biodiversity. Remote sensing and GIS tools prove effective for such environmental monitoring, highlighting critical trends and offering insights for local water management strategies to mitigate further decline. The outcomes emphasize the importance of sustainable water resource management in the context of global climate change and provide a basis for planning and preservation efforts in regional hydrology and agriculture.

Keywords: Beysehir Lake, NDWI, GIS, Remote Sensing, Landsat

INVESTIGATION OF THE EFFECT OF BORON WASTES ON CEMENT MIXTURE

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ABSTRACT

Boron deposits in Turkey, which has approximately 73% of the world's boron reserves, are operated for use in industrial production and advanced technology areas [1]. The aim of this study is to investigate the effects of boron waste remaining from the operation of boron deposits in the Emet (Kütahya) and Bigadiç (Balıkesir) regions of Turkey on chemical and mechanical properties by adding them to the cement injection mixture.

Boron waste samples taken from both regions were subjected to X-Ray Diffractometry (XRD) and X-Ray Fluorescence (XRF) methods for mineralogical and chemical analyses. As a result of the analyses, while high calcium oxide (CaO: 36.13%) content and 3.34% boron oxide (B2O3) were found in Bigadiç samples, the CaO ratio was higher in Emet samples (53.22-55.16%), and the SiO2 and B2O3 (<0.5%) ratios were very low. Boron waste samples mainly contain calcite, dolomite and minor amounts of quartz.

When the pouring was analyzed, the strength of cement injection mixtures with 5% and 10% boron waste additives was measured as 40.5 MPa and 45 MPa on average, respectively. These values show that boron waste cement meets the minimum compressive strength criteria according to international standards [2]. The use of boron wastes not only improves the mechanical properties of the cement injection mixture, but also provides significant benefits in terms of environmental pollution. Recycling of wastes shows that it can provide significant benefits in terms of both economic and environmental sustainability while reducing natural resource consumption.

Acknowledgement
This study is supported by the TÜBİTAK 2209-A University Students Research Projects Support Program.

References:
[1] https://www.etimaden.gov.tr/turkiyede-bor
[2] https://edergi.santiye.com.tr/407/#p=93

Keywords: Boron Waste Material, Cement, Chemical Properties, Mechanical Properties

DESIGNING FIBER-REINFORCED CONCRETE OVERLAYS ADAPTED TO COLD CLIMATE REGIONS IN TÜRKIYE

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ABSTRACT

Data from Türkiye's Ministry of Transport and Infrastructure highlight that highways accounts for approximately 89% of freight and 91% of passenger transport. Over the past decade, records from the General Directorate of Highways reveal a 44% rise in freight and a 30% increase in passenger transport, suggesting a substantial future demand on road infrastructure due to heavy traffic loads. In contrast to practices in developed nations, awareness of rigid pavements (concrete roads) in Türkiye is relatively promising, with flexible pavements like asphalt and seal coats predominating. These types of pavements typically require frequent preventive maintenance, rehabilitation, and overlay applications under heavy traffic load. This study investigates bonded concrete overlay on asphalt (BCOA) as an alternative approach, which has garnered increasing interest in developed countries. The analysis focuses on three pilot cities (Erzurum, Kayseri, and Afyonkarahisar) that represent harsh climatic conditions. For each city, overlay design was developed considering two levels of existing pavement distress (moderate and severe), four traffic volume categories (low, low-moderate, moderate-high, high), and three subgrade conditions (poor, moderate, good). Additionally, with the growing interest in fiber reinforcement for thin concrete overlays, this study examines design variations for both non-reinforced and fiber-reinforced scenarios at dosages of 0, 2.5, and 3.5 kg/m³. These designs are evaluated under two different joint spacing configurations: 1x1 m and 2x2 m. The findings propose customized overlay designs for each city, considering subgrade quality, traffic volume, unique climate conditions, and other relevant factors. As expected, the required overlay thickness increases with higher traffic volumes, poorer subgrade quality, and deteriorated existing pavement conditions. Notably, in addition to the primary benefit of mitigating plastic shrinkage cracking through the fiber bridging effect, the incorporation of fibers enabled a reduction in the recommended overlay thickness by up to 30%.

Keywords: Concrete Overlay, Rigid Pavement Design, Mechanistic-Empirical Approach, Thickness Design Chart

USE OF GREYWATER IN CITIES

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ABSTRACT

Water resources are becoming increasingly polluted and rapidly depleted on a global scale. This situation has revealed the necessity of new studies to protect existing water resources. New technologies, including grey and rainwater recycling, are addressing optimizing the use of limited water resources. In this study, it is stated that clean drinking water resources are limited and decreasing day by day due to various reasons, and solutions to this problem are proposed. One of the most essential methods used to protect water resources is the treatment and reuse of water, known as grey water. The basic working principles in collecting and treating grey water are mentioned, and the purposes for which recycled water can be used in cities are explained. Case studies are also included, and it is stated that domestic wastewater meets some of the water needs of Türkiye and the world. Our country has no limiting legislation on the use of gray water. However, the Ministry of Environment, Urbanization, and Climate Change amended the “Regulation on Water Pollution Control” on 17.12.2022 and added incentive principles for gray water reuse. Within the amendment's scope, the phrases “It is essential to establish infrastructure suitable for gray water reuse.” and “It is essential to evaluate the reuse opportunities of gray water and rainwater.” were added.

Keywords: Gray water, Water treatment, Domestic wastewater, Recycling

INVESTIGATION OF PROPERTIES OF WASTE CONCRETE POWDER SUBSTITUTED CEMENT-BASED MORTARS

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ABSTRACT

As a result of the demolition of buildings, that have reached the end of their lifespan and do not meet current needs, whether due to urban transformation activities or the damage from natural disasters, a large amount of construction and demolition waste (CDW) is generated. However, urbanization, industrialization and rapid population growth and rising construction activities continue to increase the demand for cement day by day. This study aimed to assess the properties of CDW-incorporated cement-based mortars and evaluate CDW's potential as a substitute to cement. In this study, the properties of mortars produced by replacing cement with 10%, 20% and 30% waste concrete powder were compared with reference samples (without waste concrete powder) through workability, flexural strength, compressive strength and ultrasonic pulse velocity tests. The substitution of waste concrete powder in mortar mixtures reduced 7- and 28-day flexural and compressive strength values. However, the strength values of samples with a 10% substitution rate were close to those of the reference samples. It was observed that the ultrasonic pulse velocity measurements taken after 28 days correlated with the compressive strength values. As the strength of the samples increased, the ultrasonic pulse speeds increased. As a result, it was concluded that waste concrete powder can be used in cement-based systems and the properties of mortars prepared with varying ratios of concrete waste as a substitute for cement in concrete should be examined in greater detail.

Keywords: Waste concrete powder, compressive strength, flexural strength, ultrasonic pulse velocity

AN EVALUATION OF DYNAMIC COMPACTION: LIMITS AND EFFECTS ON GEOTECHNICAL PERFORMANCE

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ABSTRACT

Dynamic Compaction (DC) is a soil improvement method used to increase the bearing capacity and stability of soils. This method is based on the principle of repeatedly dropping a weight into the ground from a certain height and compacting the soil particles after the drops. This method offers higher efficiency in cohesionless soils such as sand and gravel, but is not effective for water-saturated and cohesive soils. DC has a wide range of applications from motorways and airports to coastal and harbour areas. In addition to its advantages, DC also has some disadvantages. The main disadvantages are noise and the danger posed by the vibration effect for the surrounding structures. However, these disadvantages can be overcome with proper planning, environmental precautions and working with expert teams. DC plays an important role in ground improvement projects by providing a fast and economical solution.

Keywords: Dynamic compaction, Soil improvement, Geotechnical performance

STATISTICAL STUDIES IN THE PHARMACEUTICAL INDUSTRY

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ABSTRACT

In this study, the data from the article "Synthesis and characterization of hydrogels based on poly(2-hydroxyethyl methacrylate) for drug delivery under UV irradiation" were used within the scope of statistical study in the pharmaceutical industry. Two statistical methods called "Artificial Neural Networks (ANN)" in the Matlab programme and "Response Surface Method (RSM)" in the Minitab package programme were used. It was determined how close the results obtained in the programme are to the results found in the laboratory experiment. Today, with the developing technology, both time and cost are becoming increasingly valuable. For this reason, it is aimed to find results close to reality by saving time and cost with statistical methods.

Keywords: Artificial Neural Networks, Response Surface Method, Matlab, Minitab, Drug release

OPTIMIZATION OF THE REACTIVE RED 195 DYE REMOVAL FROM AQUEOUS SOLUTIONS USING ZIZIPHUS JUJUBE SEEDS USING RESPONSE SURFACE METHOD

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ABSTRACT

Water is an essential resource, crucial for the survival of all living organisms. Yet, the rapid industrialization and urbanization of recent decades have severely impacted water quality and aquatic ecosystems. One major environmental issue is the contamination of water by synthetic dyes. Various methods are employed for dye removal, but among the different techniques, adsorption stands out as one of the most preferred for treating dye-contaminated wastewater. This is due to its low cost, high removal efficiency, and environmentally friendly nature. In this study, an agricultural waste product, Ziziphus Jujube seeds was applied to investigate the removal of Reactive Red 195 (RR195) dye from aqueous solutions via the adsorption process. The study examined the effects of pH, temperature, and adsorbent dosage on adsorption efficiency. Data from the adsorption experiments were optimized using Response Surface Methodology (RSM) through the Design Expert software. The experiments were conducted with a 100-ppm reactive red 195 dye solution under varying conditions: pH levels of 2, 3, and 4; temperatures of 25 °C, 35 °C, and 45 °C; and adsorbent dosages of 0.5 g/100 mL, 0.75 g/100 mL, and 1 g/100 mL, over a 60-minute contact period. The optimal process conditions were a temperature of 25 °C, pH of 2, and adsorbent dosage of 0.75 g/100 ml. Under these conditions, RR195 dye removal efficiency reached 97.19%, with an adsorption capacity (qe) of 13.114 mg/g. Analysis of adsorption isotherms and kinetic models showed that the Freundlich isotherm and the PseudoSecond-Order kinetic model provided the best fit for describing the adsorption process. The results indicate that the synthesized adsorbent is highly effective in removing MB dye from aqueous solutions.

Keywords: Adsorption, dye removal, reactive red 195, bioadsorbent, ziziphus jujube.

GREEN CHEMICALS TO OBTAIN REDUCED GRAPHENE OXIDE

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ABSTRACT

To develop sustainable and environmentally friendly processes, researchers have focused on unhazardous compounds, such as reduced graphene oxide (rGO) instead of graphene oxide (GO). One of the synthesis methods is chemical reduction in which hydrazine and sodium boron hydride are intensively used. In this study, urea, glucose and sodium boron hydride were used during the chemical reduction method of GO as natural and green reducing compounds. The structural characterization, reduction performance, surface area measurements of rGO samples were determined with FTIR, SEM+EDS, and BET respectively to characterize the synthesis performance of rGO. According to the results obtained, SEM+EDS and BET surface area recovery results gave the best results with urea at 161.2% and 138.69%. FTIR analysis approved the prefered compounds were significantly effective to get rGO successfully. Overall outcomes of this research suggest urea performs better for the synthesis of rGO than sodium boron hydride and glucose.

Keywords: Graphene oxide, Reduced graphene oxide, Hummers TOUR method, Chemical reduction method

ENHANCED FENTON-LIKE OXIDATION FOR POLLUTANT REMOVAL VIA ZN-BDC/GRAPHENE OXIDE COMPOSITE CATALYST

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ABSTRACT

This study developed a Fenton-like oxidation method for the removal of bromophenol blue (BPB) dye from wastewater. Graphene oxide (GO) loaded Zn-BDC (Zn-benzenedicarboxylate) was used as the catalyst. The high surface area of GO and the porous structure of Zn-BDC enhanced the efficiency of the catalyst, enabling the rapid and effective removal of BPB. Reaction conditions, including catalyst dosage, and oxidant concentration, were optimized to achieve maximum removal efficiency.

The effect of H_2O_2 concentration was also investigated, revealing that an optimal concentration of H_2O_2 significantly improved the degradation efficiency of BPB. However, excessive H_2O_2 led to a scavenging effect, reducing the overall removal efficiency. Therefore, maintaining an appropriate H_2O_2 dosage was crucial for achieving maximum catalytic performance (Nie et al., 2020). The effect of catalyst dosage was evaluated, showing that an increase in catalyst dosage resulted in enhanced removal efficiency of BPB up to a certain point. Beyond this optimal dosage, the increase in catalyst amount had a negligible effect on removal efficiency, likely due to the saturation of active sites(Zhu et al., 2019). Therefore, the catalyst dosage was optimized to balance between efficiency and economic feasibility.

Scanning Electron Microscopy (SEM) analysis revealed that the GO-loaded Zn-BDC catalyst had a well-distributed, porous structure, which contributed to its high catalytic activity. According to the SEM analysis the weight percentage of the elements were found as 48.5, 3,8, 21.4 and 26.3 % for C, N, O and Zn respectively.

The SEM images of Zn-BDC@GO shows, the agglomeration of stacked graphene sheets is evident, resulting from strong specific interactions and dispersive forces between the surface groups on the graphene-like layers. The Zn-BDC@GO exhibits a porous and interconnected structure with square and lamellar formations distributed across the graphene sheets.

Fourier Transform Infrared Spectroscopy (FTIR) analysis confirmed the successful loading of graphene oxide onto the Zn-BDC framework. Characteristic peaks were observed at 1720 cm^{-1} (carbonyl group of GO), 1600 cm^{-1} (C=C stretching in GO), and 1380 cm^{-1} (carboxylate groups of Zn-BDC), indicating strong interactions between the two components(Cheng et al., 2022; Yu et al., 2020). In addition, several peaks related to the benzene ring vibration and out-of-plane vibrations of the carboxylate groups were appeared for Zn-BDC at 1630 cm^{-1} and in 1250–600 cm^{-1}, respectively.

Brunauer-Emmett-Teller (BET) surface area analysis revealed that the GO-loaded Zn-BDC catalyst exhibited a high specific surface area of 897.351 m^2/g, providing abundant active sites for the degradation of BPB.

Pore volume and pore radius were found as 0.03 cc/g and 1.908 nm, respectively. The results demonstrated that the GO-loaded Zn-BDC catalyst exhibited high efficiency in BPB removal, with a maximum removal of 95%, making it a promising method for sustainable wastewater treatment. The study also provided analyses on the reusability and stability of the catalyst, highlighting its economic and environmental applicability.

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Keywords: Catalytic Degradation, Fenton-Like Oxidation, Metal Organic Framework, GO, Dye Removal

PHOTOCATALYTIC APPLICATIONS OF METAL OXIDES FOR ENVIRONMENTAL AND ENERGY SOLUTIONS

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ABSTRACT

Metal oxides hold a significant place in the field of photocatalysis due to their wide range of applications in environmental remediation, energy conversion, and biomedical sciences. These materials exhibit unique electronic, optical, and structural properties, such as wide band gaps, chemical stability, and tunable surface characteristics, making them highly attractive for various catalytic applications. Their potential for addressing critical environmental challenges, including the degradation of organic pollutants, water splitting for hydrogen production, and carbon dioxide reduction, positions metal oxides as key materials for transitioning to sustainable technologies.

Recent advances in materials science have highlighted the importance of innovative strategies to enhance the photocatalytic performance of metal oxides. Methods such as structural modifications, defect engineering, and nano-composite formulations have proven effective in overcoming intrinsic limitations like electron-hole recombination and limited visible light absorption. These strategies enable bandgap tuning, improved charge carrier dynamics, and optimized surface reactivity, significantly boosting their performance.

This brief review presents an analysis of these innovations aimed at improving the photocatalytic efficiency of metal oxides and scientifically compares various approaches. It examines how these materials are modified and integrated into composite systems, elucidating the fundamental mechanisms behind performance enhancements and identifying promising research directions for environmental and energy applications.

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Keywords: Metal oxides, Photocatalysis, Environmental sustainability

HYDROGEN PRODUCTION FROM NATURAL GAS

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ABSTRACT

This research paper deals with the history of gas production in Iraq, where production began in 1927, where production is classified into associated gas and free gas. In addition to the importance of the global shift from the use of fossil fuels to renewable energy because of its clear impact on improving the environment. The production of hydrogen is considered one of its most important sources. It also focuses on methods of producing hydrogen production from natural gas through the reformation of steam and methane at high temperatures. This paper also addresses the importance of hydrogen uses in the transportation sector and its effects on the environment in general.

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Keywords: Hydrogen, Natural gas, Carbon, Associated gas

CHITOSAN-BASED DRUG CARRIER SYSTEMS

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ABSTRACT

Respiratory diseases are becoming increasingly prevalent worldwide and are significantly responsible for global mortality, including conditions such as asthma, chronic obstructive pulmonary disease, pneumonia, cystic fibrosis, lung cancer, and coronavirus-related illnesses. Therefore, research aimed at enhancing the efficacy of treatments for these diseases has focused on nanoparticle-based pulmonary drug delivery. Chitosan (CS)-based nanoparticles, due to their intrinsic biological properties, offer significant advantages over other nanocarriers. These benefits include anti-inflammatory, antimicrobial, and mucoadhesive properties. CS nanoparticles have the ability to improve drug stability, prolong their duration of action, enhance targeting, and increase solubility and permeability. Due to these properties, CS nanoparticles are a promising candidate for pulmonary applications. This study aims to highlight the pulmonary drug delivery potential of chitosan nanoparticles and evaluate the role of chitosan in treating respiratory conditions. Furthermore, it provides a vision of potential advancements in therapy through an in-depth analysis of the interactions between CS nanoparticles and drugs.

Keywords: Drug, Carrier systems, Chitosan

INVESTIGATION ON THE COMMON ANALYSIS METHODS FOR DETECTING ILLICIT DRUGS IN WASTEWATER

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ABSTRACT

In this study, research was carried out analytical devices used to detect illicit drugs that threaten public health. In 2022, one in 18 people or approximately 292 million people had used illicit drugs in the past year, and this number has increased by more than 20% considering the past decade. Approximately 30 million people used amphetamines, and 60 million people used opioids in past year. While drug use, especially opioid use, remained the largest global burden of disease, the harmful consequences of illicit drug use are numerous. Cannabis use is increasingly causing people to seek drug treatment services. It is estimated that 81 million people, or 64 million worldwide, suffer from drug use disorders in 2022. Approximately 13.9 million people used drugs by injection in 2022 [1, 2].

Many disciplines are used to estimate the prevalence of illicit drugs and their metabolic products in wastewater. Different branches of science work collaboratively, including analytical chemistry, physiology, biochemistry, sewage engineering, spatial epidemiology and statistics, and pharmaceutical/public health epidemiology. Wastewater-based epidemiology is an innovative and promising discipline that has recently been used for individual biomonitoring and estimating the amount and type of illicit drug use in the population [3, 4].

In these studies, which have been intensively examined worldwide, especially in the last five years, the analysis of various illicit drugs has been examined. Many analytical devices (Ultra-High-Performance Liquid Chromatography/ High-Resolution Mass Spectrometry (UHPLC–HRMS), Liquid Chromatography coupled to Tandem Mass Spectrometry (LC-MS/MS), UPLC-MS/MS, LC-HRMS, DI-LC-MS/MS, SPE-LC-MS/MS) have been studied. LC-MS/MS has been found to be one of the most preferred devices due to its detection and sensitivity of the desired substances.

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Keywords: Illicit Drugs, Wastewater-based Epidomiology, Analysis Methods

SALT THERAPY: MYTHS, FACTS, AND HEALTH IMPLICATIONS

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ABSTRACT

Salt therapy (halotherapy) is an alternative therapeutic approach that involves the use of natural or artificial salt environments to improve respiratory and skin health. Although anecdotal evidence supports its benefits, scientific research on salt therapy remains limited. This article explores the mechanisms, potential effects, and limitations of salt therapy, focusing on its impact on respiratory and skin conditions. The primary mechanisms of action include anti-inflammatory effects, antimicrobial properties, and the presence of negative ions, which may contribute to improved airways function and overall well-being. However, the lack of standardized practices, potential risks associated with prolonged exposure to salt particles, and the limited scientific evidence raise concerns about its efficacy and safety. While some studies suggest symptom relief in individuals with asthma, bronchitis, and skin disorders, long-term clinical trials are necessary to confirm these findings. Salt therapy also shows promise in managing allergic rhinitis and other skin conditions like eczema and psoriasis. However, there are risks, such as irritation of the respiratory system and skin dryness, particularly in sensitive individuals. To ensure safety, salt therapy should be performed under medical supervision, especially for individuals with pre-existing conditions. This review calls for more rigorous research to establish the therapeutic efficacy and safety of salt therapy in clinical practice

Keywords: Salt therapy, halotherapy, respiratory health, skin conditions, anti-inflammatory effects

DEEP LEARNING BASED FAULT DETECTION FOR PCB QUALITY CONTROL USING YOLO

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ABSTRACT

Printed circuit boards (PCBs) are fundamental components in electronics, and their quality control process is both critical and time-consuming. Traditional inspection methods are error-prone and slow, highlighting the need for systems capable of automatic fault detection. This study focuses on the development of a deep learning-based system that uses the YOLO (You Only Look Once) algorithm for fault detection of components on printed circuit boards (PCBs). In this context, a labeled dataset containing seven different types of defects—missing hole, mouse bite, open circuit, short, spur, spurious copper, and background—is created. The dataset is divided into 30% test and 70% training data, and the YOLO algorithm is trained. The model achieves 99% accuracy in detecting "missing hole" and "short" defects, while the accuracies for "mouse bite", "open circuit", "spur", "spurious copper", and "background" defects are 85%, 93%, 88%, 92%, and 64%, respectively. In particular, the misclassification of the "background" defect reveals the need for improvement in this area, which requires higher accuracy. Future work aims to increase accuracy by expanding the dataset, applying advanced data augmentation techniques, and selecting efficient parameters during hyperparameter optimization. The system has the potential for real-time use in industrial applications and can make an important contribution to PCB quality control processes.

Keywords: YOLO, PCB, fault detection, deep learning, object detection, quality control.

SALT RADIOACTIVITY

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ABSTRACT

Salt is a widely used mineral, prized for its culinary and medicinal benefits, but certain types of salt may contain natural radioactivity due to the presence of radioactive isotopes such as potassium-40 (K-40) and radon-226 (Ra-226). These isotopes contribute to background radiation, which can have varying effects depending on the salt's source. This article reviews the natural radioactivity in salt, exploring the radioactive isotopes present, their potential environmental impact, and the health implications for human consumption. While the radiation levels in most salts are low and do not pose significant health risks, prolonged exposure to high levels may cause health concerns. The paper also investigates the radioactivity levels in various salts, including Himalayan and sea salts, and concludes that the radioactive content in most salts is too low to affect human health. A balanced approach to salt consumption, with attention to its source, is advised to minimize any potential risks.

Keywords: Salt, Radioactivity, Potassium-40, Radon-226, Natural Isotopes

THE EFFECT OF DOMINANT SIDE ON THE LOWER EXTREMITY FLEXIBILITY IN ADOLESCENT SHOOTING ATHLETES

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ABSTRACT

Shooting athletes are observed to maintain a static posture for long periods during training and competitions. There are no studies yet examining the effect of the dominant extremity on lower extremity flexibility (LEF) in air rifle shooters ARS. The purpose of this study was to investigate the effect of the dominant extremity on LEF and the relationship between LEF and core muscle strength (CMS) in ARS. This study included adolescent ARS in Çankırı. The athletes were questioned about their age, height, weight, experience levels, and dominant shooting extremities. They were evaluated using sit-and-reach tests for right and left lower extremities, trunk flexion endurance tests, plank tests, and the Sorensen test. The average age of the athletes was 15 (±0.51) years. The average BMI was 21.63 (±1.04) kg/m², and the average duration of shooting experience was 27 (±6.52) months. The right side was the dominant extremity for all athletes in the study. According to the sit-and-reach test results, the right LEF was greater than the left LEF ($p<0.001$). No correlation was found between LEF and CMS ($p>0.05$). The results of this study show that the LEF of the dominant side is greater in ARS, and that LEF is not correlated with CMS. Similar to this study other studies found no correlation between CMS and flexibility in shooting athletes. Research found that the effect of flexibility on shooting success is 34%. It is shown that flexibility plays a crucial role in shooting athletes and can directly affect shooting performance, considering the importance of posture during shooting. Although no relationship was found between LEF and CMS, we suggest that flexibility and strength exercises should be incorporated to improve body symmetry and enhance shooting performance, considering the athletes' young age and relatively short experience.

Keywords: Shooting athletes, Lower extremity flexibility, Core muscle strength, Dominant extremity

GUT MICROBIOME AND SALT CONSUMPTION

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ABSTRACT

The gut microbiome is a complex ecosystem of microorganisms residing in the digestive tract, playing a crucial role in human health by influencing metabolic processes and immune functions. Recent research has increasingly focused on dietary factors that affect this microbiome, particularly salt consumption, which has been traditionally overlooked in discussions of healthy eating. This review examines the relationship between salt intake and gut microbiome health, highlighting the adverse effects of excessive salt consumption. High salt intake has been shown to disrupt the balance of beneficial bacteria, particularly Lactobacillus species, leading to a proliferation of harmful bacteria. Such dysbiosis is associated with various health issues, including hypertension, obesity, and metabolic syndrome. Additionally, the inflammatory processes triggered by high salt intake can compromise immune function and promote chronic diseases. This review aims to shed light on the mechanisms by which salt consumption impacts the gut microbiome and to discuss potential intervention strategies for promoting gut health and overall well-being.

Keywords: Gut microbiome, high salt intake, microbiome diobsis, systemic inflammation, metabolic disorder

CURRENT DEBATES ON FOOD SALT

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ABSTRACT

Salt has been integral to human nutrition and culinary practices throughout history, providing essential minerals and enhancing food flavor. However, high sodium intake is strongly linked to health risks, particularly hypertension, cardiovascular disease, and kidney issues, leading to increased attention on sodium reduction in diets. This study explores the mineral composition of various salt types, including table salt, sea salt, and natural rock salts like Himalayan and Çankırı salts, evaluating their potassium, calcium, magnesium, and iron content. While these salts contribute trace minerals, they do not meet daily nutritional needs on their own, making a balanced diet essential for adequate mineral intake.

In response to sodium-related health concerns, low-sodium salt alternatives—achieved by partially replacing sodium chloride with potassium chloride—have emerged. Although beneficial for sodium reduction, potassium chloride can produce a metallic taste, posing sensory challenges for consumers. Flavor enhancers are sometimes used to improve the palatability of low-sodium salts, facilitating their acceptance as a healthier alternative. Additionally, gourmet salts, prized for their unique trace mineral content and culinary qualities, have gained popularity, though they provide only minimal mineral contributions to daily intake requirements.

Beyond dietary applications, this study examines salt therapy's potential in respiratory health and dermatological care. Salt therapy, often conducted in salt caves or specialized rooms, may alleviate conditions such as asthma, COPD, and certain skin disorders. The therapeutic use of Çankırı's salt caves, specifically, has garnered interest in both health and tourism sectors. However, while preliminary findings suggest some respiratory benefits, further research is necessary to confirm salt therapy's effectiveness and establish evidence-based guidelines for its use in wellness tourism.

The study also reviews global sodium reduction strategies, including governmental and public health initiatives to lower sodium levels in processed foods and promote awareness of sodium-related health risks. Such efforts, supported by organizations like the World Health Organization, aim to reduce the prevalence of diet-related diseases by encouraging lower sodium intake and the adoption of healthier eating habits.

In conclusion, while salt is vital to human health, responsible consumption is crucial. Reducing sodium intake, selecting low-sodium alternatives, and using salt primarily as a flavor enhancer rather than a mineral source are key to better health outcomes. Additionally, expanding clinical research on salt therapy may open new pathways in health tourism and natural wellness practices.

Keywords: Salt, Minerals, Low Sodium, Salt Therapy, Health

ASSESSING DRINKING WATER QUALITY: KEY PARAMETERS, CONTAMINANTS, AND HEALTH IMPLICATIONS

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ABSTRACT

Drinking water is essential for human health, with access to clean water significantly impacting quality of life. However, water pollution and mismanagement threaten drinking water quality worldwide. The World Health Organization (WHO) estimates that millions suffer annually from waterborne diseases due to contaminated drinking water. This review explores the key factors influencing drinking water quality, common contaminants in water sources, and their health implications.

Assessing drinking water quality involves evaluating physical, chemical, and biological parameters. Physical parameters include color, turbidity, taste, and odor, while chemical parameters focus on the concentration of minerals and chemicals. Biological parameters detect microorganisms that may pose health risks. Contaminated drinking water can cause various health issues, particularly for vulnerable populations like children and individuals with weakened immune systems.

The study presents criteria for evaluating drinking water quality, based on established standards. Important parameters include pH, total hardness, nitrate, ammonium, chlorine, and coliform bacteria presence. These criteria are classified into good, moderate, and poor quality levels, aiding in determining water safety.

Furthermore, the review examines strategies and technologies to enhance drinking water quality. Solutions such as water purification systems, safeguarding water sources, and increasing public awareness about water quality are vital for improving safety. Ongoing research in water management and quality is crucial for sustainable water resource development. This review aims to raise awareness about the significance of drinking water quality improvement and contribute valuable insights to the literature, fostering effective strategies for enhancing public health through safe drinking water access.

Keywords: Drinking Water Quality, Water Contaminants, Health Implications, Water Quality Assessment, Water Safety Standards

MINERAL FORTIFICATION OF SALT

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ABSTRACT

Mineral-enriched salts go beyond their traditional role as flavor enhancers, offering the potential to deliver essential minerals that support human health. These salts contain not only sodium chloride but also beneficial minerals such as iodine, potassium, magnesium, zinc, and calcium, which are crucial for addressing mineral deficiencies in populations. Salt, historically significant in various cultures for its preservative and health-related properties, has also been associated with health risks, particularly when consumed in excess. Excessive salt intake can lead to hypertension and cardiovascular diseases, which have spurred the development of reduced-sodium and mineral-enriched salts as alternatives to improve public health.

Iodine is one of the most commonly added minerals to salt due to its importance in thyroid function. Iodine deficiency can lead to conditions like goiter, and iodized salt has proven effective in mitigating this issue on a global scale. Potassium, another essential mineral, plays a crucial role in regulating blood pressure, balancing sodium intake, and supporting heart health. Potassium-enriched salts provide an alternative for individuals at risk of hypertension, offering a natural way to balance sodium intake and promote cardiovascular wellness. Magnesium, vital for muscle function, nerve transmission, and immune health, is also a key mineral added to salt to enhance its health benefits. Zinc, known for its role in immune function, wound healing, and cellular growth, further strengthens the health profile of mineral-enriched salts.

The production of mineral-enriched salts involves integrating these minerals into the salt matrix while ensuring their stability and bioavailability. This process requires overcoming challenges such as ensuring the uniform distribution of minerals and stabilizing their presence over time. Potassium chloride, for instance, can impart a bitter taste that affects consumer acceptance. To address this, flavor enhancers and taste modifiers are often incorporated to make these salts more palatable.

Consumer acceptance of mineral-enriched salts is largely driven by growing awareness of their health benefits. However, the widespread adoption of these products faces hurdles, including issues related to product stability, shelf life, and cost. Future advancements in production techniques, as well as educational initiatives to increase public awareness of the health benefits, could significantly improve the reach and impact of mineral-enriched salts, particularly in developing regions where mineral deficiencies are more prevalent. These salts present a promising solution to improving public health and reducing the prevalence of mineral deficiencies on a global scale.

Keywords: Mineral-enriched salts, health benefits, iodized salt, potassium chloride, sodium reduction

COFFEE GASTRONOMY

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ABSTRACT

Coffee transcends being merely a beverage; it offers a rich cultural and gastronomic experience deeply rooted in traditions worldwide. This article explores the art of coffee tasting, preparation techniques, regional flavor profiles, and food pairings. Coffee beans vary in chemical compositions depending on their types, influencing their flavor profiles. Coffea arabica and Coffea canephora (Robusta) are the most common coffee varieties; Arabica beans provide soft and fruity flavors, while Robusta delivers a stronger and more bitter taste.

The flavor of coffee is affected by brewing methods. Different techniques such as espresso, cold brew, Turkish coffee, and French Press enhance the coffee's aromas and tastes. Coffee is intricately woven with cultural elements such as socialization and hospitality. The recognition of Turkish coffee as an Intangible Cultural Heritage by UNESCO underscores its gastronomic and cultural significance.

Moreover, the coffee tasting process (cupping) is a professional practice where the sensory attributes of coffee beans are evaluated. This method allows for the analysis of aroma and flavor profiles that vary depending on the coffee's region of origin. Coffee gastronomy provides a deep experience with its rich diversity and cultural heritage while playing an essential role in health and sustainability. Future research aims to evaluate these aspects of coffee more comprehensively.

Keywords: Turkish Coffee, Cultural Heritage, Brewing Techniques, Health Benefits

IS VITAMIN-ENRICHED SALT FEASIBLE?

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ABSTRACT

This paper explores the scientific and technical feasibility of incorporating vitamins into salt, a common food product consumed globally. It discusses the potential challenges associated with vitamin stability, bioavailability, taste compatibility, and consumer acceptance when vitamins are added to salt. The article also addresses the nutritional benefits and public health impact of vitamin-enriched salt, particularly in regions where vitamin deficiencies are prevalent. Despite the potential advantages, several technical limitations, including the sensitivity of certain vitamins to light, heat, and moisture, as well as the interaction of vitamins with the salt matrix, are examined. For example, water-soluble vitamins like vitamin C are highly sensitive to external factors and may degrade quickly when exposed to salt for extended periods. The paper further explores potential solutions to these challenges, such as the use of encapsulation technologies like microencapsulation, which can enhance the stability of vitamins and protect them from degradation. The potential benefits of vitamin-enriched salt include improving the intake of essential vitamins in populations with limited access to a diverse diet, providing a cost-effective way to address vitamin deficiencies, and enhancing public health outcomes related to immune function and bone health. However, the risks associated with excessive intake of certain vitamins, particularly fat-soluble vitamins, are also discussed, highlighting the importance of proper dosage control in the production of vitamin-enriched salts. The paper concludes that while vitamin-enriched salt offers promising potential as a tool for addressing vitamin deficiencies, further research and development are needed to address the technical challenges of stability, bioavailability, and taste compatibility. Additionally, more studies are required to ensure the safety and effectiveness of such products, with a focus on consumer acceptance and regulatory guidelines for vitamin fortification in salt. The future of vitamin-enriched salt lies in the development of advanced delivery systems and the refinement of production techniques to ensure both efficacy and safety in its use as a public health tool.

Keywords: Vitamin-enriched salt, stability, bioavailability, microencapsulation, public health

TURKISH FOOD CODEX SALT COMMUNIQUÉ

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ABSTRACT

Salt holds a fundamental importance in human nutrition and various industrial sectors. As a critical component of dietary regimes, it must be handled with great care concerning food safety. In Turkey, the hygienic production of salt, iodization, and packaging are regulated by the Turkish Food Codex Salt Communiqué (Communiqué No: 2013/48). This article examines the details of the communiqué and offers suggestions to enhance public health and consumer awareness.

The communiqué ensures that salt is produced under hygienic and suitable technical conditions, thereby safeguarding food safety. This regulation aims to maintain hygienic standards throughout the production and storage processes. Hygienic production not only protects consumers from health risks but also ensures that producers comply with national and international standards.

Moreover, natural salts can contain impurities that may be introduced through contamination. While limits are specified for heavy metals such as arsenic, copper, lead, cadmium, and mercury, there is currently no restriction concerning microplastics, despite their increasing prevalence in natural salts like sea salt. The potential harmful effects of microplastics on human health necessitate regulations in this area.

Additionally, the regulation mandates that iodized salts contain 25-40 mg/kg of potassium iodate to combat iodine deficiency-related diseases, particularly thyroid disorders. However, the loss of iodine over time due to exposure to light, heat, and air can compromise the effectiveness of iodization, which is why a two-year shelf life is established for refined salt.

In light of rising cardiovascular diseases and hypertension, reduced-sodium salts are crucial, yet the communiqué excludes these options. Incorporating reduced-sodium salts into regulations could provide consumers with healthier alternatives.

Keywords: Food Safety, Iodized Salt, Heavy Metals, Salt Regulation, Consumer Awareness

GENERALIZED Q-SRIVASTAVA-ATTIYA OPERATOR ON MULTIVALENT FUNCTIONS

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ABSTRACT

In this article, we define a generalized q-integral operator on multivalent functions. It generalizes many known linear operators in Geometric Function Theory (GFT). Inclusions results, convolution properties and q-Bernardi integral preservation of the subclasses of analytic functions are discussed.

Keywords: Multivalent functions, q-difference operator, q-Srivastava-Attiya operator, starlike and convex functions q-generalized Bernardi operator.

R,S,T-SPHERICAL FUZZY SOFT SETS

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ABSTRACT

This study introduces the concept of r,s,t-Spherical Fuzzy Soft Sets (rst-SFSS), building upon and extending the traditional T-Spherical Fuzzy Soft Sets (T-SFSS) framework. The proposed rst-SFSS model enhances the flexibility and applicability of fuzzy soft sets by incorporating distinct degrees for membership, neutral membership, and non-membership, allowing for a more comprehensive representation of uncertain and imprecise information. Within this extended framework, various fundamental operations such as complement, subsethood, equality, union, and intersection are rigorously defined, providing a foundational structure for complex data analysis. Additionally, the properties of these operations are thoroughly examined to establish their logical coherence and practical applications, particularly in fields that rely on multi-criteria decision-making processes.

Keywords: r,s,t-spherical fuzzy sets, soft set, fuzzy soft set, r,s,t-spherical fuzzy soft sets

A NOTE ON THE GEOMETRIC FEATURES OF STANCU-TYPE SCHURER OPERATORS ENHANCED WITH SHAPE PARAMETERS

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ABSTRACT

Sergei Bernstein [1] proposed a new approach to the proof of the Weierstrass Approximation Theorem [2] by establishing the Bernstein operators in 1912. These operators have since become widely recognized for their simplicity, ease of use in computer evaluations, and their ability to preserve the essential characteristics of the associated functions they approximate. As a result, there have been numerous studies exploring various variants of these operators. One such approach involved adding nonnegative parameters to the approximated functions. For instance, Dimitrie D. Stancu [3] introduced two nonnegative real parameters p and r, providing greater flexibility and control over the approximation process. This allowed for more tailored approximations that could better preserve specific properties of the function, such as its shape, monotonicity, and convexity. Similarly, Schurer [4] proposed a remarkable variation of the Bernstein operators by incorporating a nonnegative parameter γ to the domain of the approximated function, which is both linear and positive. On the other hand, introducing parameters to the bases functions also adds more flexibility to approximation methods. In 2010, Ye et al. [5] established a new class of bases called Bézier bases, based on shape parameters λ chosen from the interval [-1,1]. Bézier bases are essential in approximation methods that aim to preserve specific shapes and are widely used in computer graphics and geometric modelling. Ansari et al. [6] recently introduced the Stancu variant of Schurer operators associated with shape parameter λ and analyzed their approximation properties. In this talk, we will focus on the geometric characteristics of these operators, presenting our results on their shape properties, along with numerical results and computer graphics.

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Keywords: Schurer bases, shape parameter, 2-convex, divided differences, computational analysis

ON GENERATORS OF THE BIG MAPPING CLASS GROUP

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ABSTRACT

Let S denote a second countable, connected, orientable surface. If the fundamental group of S is finitely generated, the surface S is of finite-type. Otherwise it is of infinite-type. The mapping class group of an infinite-type surface is called the big mapping class group - has recently become an intersting subject of intensive study which has connections with geometric group theory, dynamical systems, etc. Many authors gave some sets of generators for the mapping class group of finite-type surfaces. However, for the big mapping class groups, not much has been done.

Let S=S(n) be the infinite-type surface with n ends, where n∈N, accumulated by genus. Recently, it was shown that the big mapping class group of S(n) can be generated by five involutions, i.e. elements of order two [1]. This also implies that it can be generated by four elements for n≥6. In this talk, I will state a new result saying that the big mapping class group of S(n) can be generated by three elements for n≥6.

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Keywords: Big mapping class grups, infinite surfaces, generating sets.

LITHIUM ION BATTERIES: BATTERY FAILURE&FIRE AND INTERVENTION METHODS FOR BATTERY FIRE IN ELECTRICAL VEHICLES

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ABSTRACT

Lithium-ion batteries (LiBs) are widely used and especially with the widespread use of electric vehicles, the use of LiBs are increasing. Lithium-ion batteries simply consist of anode, cathode, electrolyte, separator and current collectors such as copper and aluminum. LiBs are intricate industrial products that may cause mistakes in design, manufacture, and usage, which can result in safety incidents. To improve battery safety, it's critical to have a thorough understanding of the failure mechanisms that might arise in different scenarios. In particular, the types of damage that can occur can be classified as mechanical damage, thermal damage and electrical damage. Another important issue is the intervention method to be applied to lithium-ion batteries after the damage occurs. In the scope of this study, the structure of LiBs, LiB types, the types of damage that can occur in LiBs used in electric vehicles in particular and the methods of intervention in possible fires will be discussed.

Keywords: Li-ion Battery, Failure, Battery Fire, Intervation

EFFECT OF PROCESSING PARAMETERS ON THE RELATIVE DENSITY USING LASER MELTING METHOD

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ABSTRACT

In this study, the relative density variation in powder size ranges and other properties were investigated on the samples to be produced with different scanning strategies and parameters by selective laser melting method. In the first part of the research, small cubic samples (5 x 5 x 5 mm^3) were produced by varying the laser power, scanning speed and scanning distance at constant layer thickness. The relative densities of the samples were measured with the help of Archimedes' principle and the parameters that enable the production of samples close to 100% relative density were determined. When the scanning speed was kept at 750 mm/s and the laser power in the range of 160-200 W, metal parts with high density and excellent quality could be obtained. Especially when the laser power is 160 W. [1] According to the results of this study, which examined the effects of different scanning strategies, it was found that the relative density of the samples using the double scanning strategy was better than those produced with a single scanning strategy. [2] Under optimum conditions of optimum laser power, high scanning speed, low scanning distance and optimum beam compasation, the density difference between the measurements made in Archimedes experiments was measured as minimum. In the study; Laser power: Average 310, minimum 180, maximum 440, Scanning Speed: Average 900, minimum 600, maximum 1200, Scanning Distance: Average 100, minimum 70, maximum 130. Since laser power is the most important parameter that will affect the surface and volume properties of the sample, it affected the density of the samples. The average density ratio of 0-53micron materials (95.62%) is higher than the density ratio of 20-53 micron materials (92.95%). Also, the maximum and minimum density ratios are %98.47 and %79.27 for 0-53micron materials and the maximum and minimum density ratios are %97.10 and %75.40 for 20-53micron materials.

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Keywords: SLM, Additive Manufacturing, CoCr, Powder Metallurgy

AN EXPERIMENTAL STUDY OF DC MOTOR APPLICATION BASED ON MPPT DC-DC BUCK-BOOST CONVERTER POWERED BY PHOTOVOLTAIC GENERATORS USING AKBABA MODEL

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ABSTRACT

Photovoltaic generators (PVGs) are a kind of renewable energy technology that transforms solar radiation into electrical power. The Maximum Power Point Tracker (MPPT) optimizes power generation on a small scale for independent PVG systems. This study aims to develop, evaluate, and use an innovative MPPT circuit for small-scale PVGs. The control circuit utilizes a microcontroller, while the Akbaba Model represents the I-V characteristics of the PVG. The suggested system utilizes a DC/DC buck-boost converter. The microcontroller calculates the converter's duty cycle by using feedback from the output voltage and converts the intensity of solar radiation into a reference value for control. A prototype is created to empirically verify the suggested methodology.

Keywords: Akbaba model, DC motor, MPPT, Photovoltaic generators, Renewable energy

DETERMINATION OF THE POTENTIAL INHIBITORY POTENTIALS OF SOME THIOSEMICARBAZONE COMPOUNDS ON GLYCERALDEHYDE-3-PHOSPHATE DEHYDROGENASE ENZYME

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ABSTRACT

Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) is a widely expressed enzyme essential for glycolysis and has gained significant attention for its diverse roles in cancer biology. Beyond its primary function in glycolysis, GAPDH exhibits non-enzymatic activities that are closely linked to cancer progression, invasiveness, and metastasis. Its enzymatic role involves catalyzing the conversion of glyceraldehyde-3-phosphate to 1,3-bisphosphoglycerate, a critical step in the glycolytic pathway. This process is particularly advantageous for cancer cells, supplying the energy necessary to sustain their rapid proliferation and adapt to the challenging conditions of the tumor microenvironment. In the presented study, the binding potential of some thiosemicarbazone compounds to the active site of this enzyme was investigated by molecular modeling method. In addition, detailed maps of the binding patterns of the molecules to the active site of GAPDH enzyme were obtained.

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Keywords: Glyceraldehyde-3-phosphate dehydrogenase, Thiosemicarbazone, Docking, Cancer

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APPLICATION AND ESSENTIAL COMPONENTS OF SERIAL AND PARALLEL CHOPPER CONVERTERS

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ABSTRACT

Series and parallel converters are essential components in modern energy conversion systems, finding applications in various industries, including electric vehicles and solar energy systems. Switch-mode power conversion technology, particularly Buck, Boost, and Buck-Boost converters, is widely used for efficient DC-DC voltage conversion [1]. This article delves into the practical applications of series and parallel converters, exploring their circuit components and operational principles. By analyzing MATLAB simulations, we can understand how these converters respond to varying load and input conditions. In industries like automotive and industrial power supply, series and parallel inverters are employed to optimize power distribution and control [2-3]. These inverters enable efficient power management in electric vehicles, regulating motor power and battery performance. Similarly, in industrial settings, inverters adapt output power to meet load requirements, improving energy efficiency [4]. Chopper converters, a type of DC-DC converter, are used to regulate voltage levels. While simple potentiometers can be used for low-power applications, electronic choppers offer more precise control and efficiency. These converters utilize components like inductors, capacitors, and semiconductor switches to efficiently convert DC voltage [5]. Series and parallel chopper converters are increasingly used in modern technologies due to their ability to save energy and adapt to changing load and voltage conditions. They play a crucial role in enhancing power management capabilities and facilitating the transition towards sustainable energy systems [6]. By optimizing energy utilization and enabling efficient response to fluctuating power demands, these converters contribute to a more energy-efficient future.

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Keywords: Motor control, DC voltage, Power supply, Output current

COMPARISON OF THE PERFORMANCE OF DIFFERENT PV SYSTEM CONFIGURATIONS UNDER PARTIAL SHADING

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ABSTRACT

This paper aims to analyze the performance of various photovoltaic (PV) array configurations under different partial shading conditions. With the growth of solar energy adoption, PV systems are increasingly installed in environments where shading from buildings, trees, or obstacles is common. Partial shading disrupts light distribution on PV modules, leading to power losses, particularly in series configurations where shading of a single module can affect the entire string. To address this, configurations like Serie, Series-Parallel, Total Cross-Tied (TCT), Bridged-Link (BL), and Honey-Comb (HC) have been developed to enhance shading resilience [1,2]. Using MATLAB/Simulink simulations, these configurations were tested under four shading levels—0%, 20%, 40%, and 60%—to observe their current-voltage (I-V) and power-voltage (P-V) characteristics, as well as fluctuations in the maximum power point (MPP) [3]. The TCT configuration demonstrated the highest resilience to shading, maintaining a higher fill factor and power output compared to the other configurations [4]. Results indicate that TCT configuration offers the highest resilience, producing 2672 W and 2524 W at 40% and 60% shading, respectively, significantly outperforming series configurations, which show substantial power reductions. The BL and HC configurations also demonstrate superior performance, with fill factor values that confirm the robustness of TCT against shading effects. Overall, the TCT configuration proved to be the most effective in minimizing power losses under shading conditions, followed by the BL and HC configurations. These findings suggest that the TCT configuration is best suited for environments with high shading risk, while the Series configuration performs well in unshaded conditions. This research underscores the importance of PV configuration choice for sustainable energy performance in real-world settings where shading is a concern [5].

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Keywords: Photovoltaic Configurations, Partial Shading, MATLAB/Simulink, Power Output, Fill factor

THE REACTIVE POWER COMPENSATION TO IMPROVE WIND TURBINE STABILITY

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ABSTRACT

Power system reliability is heavily influenced by the efficiency of the power supply network. The surge in renewable energy sources, particularly wind power, has necessitated a deeper understanding of wind turbine system stability.[1] This study delves into the impact of reactive power on wind turbine stability, identifying critical factors that can compromise system performance [2]. Wind speed and blade pitch angle emerge as key parameters affecting wind turbine energy output.[3] Wind speed, in turn, is modulated by air temperature, which influences air density and consequently wind speed variability. To simulate and analyze these dynamics, a comprehensive wind turbine model has been developed and implemented in MATLAB/Simulink [4]. Reactive power compensation is a promising technique to enhance power efficiency by mitigating current and voltage distortions.[5] This study investigates the power characteristics of wind turbines under varying pitch angles and the reactive power behavior across different wind speeds. Furthermore, it explores various reactive power compensation techniques and conducts a comparative analysis of existing methods from the literature [6]. By gaining insights into the interplay between reactive power, wind speed, and blade pitch angle, this research contributes to the development of strategies to improve wind turbine stability and overall power system reliability [7].

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Keywords: Electric quality, Wind speed, Statcom, Reactive power compensation

DESIGN DUAL-BAND MICROSTRIP PATCH ANTENNA BY USING A RECTANGULAR HOLE

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ABSTRACT

Patch antennas are used in different types of equipment for transmitter and receiver signals that operate at high frequencies many devices such as mobiles, wireless devices and satellites, because they have different features like small size, directivity, space-saving, and efficiency. By using this kind of antenna, wireless communications are remarkable and rapid development, to be used in the medical, industrial, educational, military and the Internet of Things and other applications.

We designed a dual-band frequencies patch antenna in this paper, by using a new approach, by making a rectangular hole in the patch antenna microstrip, we got it a dual-band antenna in one layer. Our This patch antenna was designed to work at 3.8GHz for the first band and the second band is 6GHz, and it works in the open frequencies field. The values of the attenuation (S11) are equal to -42dB for the first band and -32dB for the second band, which are good and suitable values for both frequencies, and the same for the radiation patterns such as gain, radiation efficiency, and directivity.

Keywords: Microstrip Patch antenna, Antenna, Dual-band, ADS.

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DYNAMIC RESYNCHRONIZATION UNITS IN MICROGRIDS TRANSITIONS

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ABSTRACT

Microgrids, as decentralized energy systems, play a pivotal role in the modern energy landscape, offering flexibility, resilience, and sustainability. At the heart of this system lies the resynchronization unit, a critical component ensuring the seamless transition of microgrids between grid-connected and islanded operational modes. This paper offers a comprehensive examination of the intricacies and nuances of the resynchronization unit within microgrids. The transition between grid-connected and islanded modes is not just a switch but a complex process that requires precision and reliability. The seamless nature of this transition is vital to prevent disruptions, power quality issues, and potential equipment damage. It is here that the resynchronization unit proves its mettle, ensuring that the transition occurs without hitches. Factors such as synchronization speed, voltage and frequency matching, and phase alignment are of paramount importance. However, designing such a unit is not without its challenges. Issues related to transient stability, harmonics introduction, and potential feedback loops can complicate the resynchronization process. To address these challenges, this paper presents several proposed solutions aimed at enhancing the reliability and efficiency of island microgrids during resynchronization. These include advanced control algorithms, integration of fast-response energy storage systems, and utilization of state-of-the-art power electronics.

Keywords: Microgrids, Resynchronization Unit, Grid-connected, Islanded Modes

OPTIMIZATION BASED ENERGY MANAGEMENT APPROACH FOR PROSUMERS LOCATED IN SMALL-SCALE MICROGRIDS

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ABSTRACT

Benefits of integrating renewable energy resources (RESs) into the electrical grid include increased efficiency and less strain on transmission lines and the need for significant infrastructure investments. Therefore, presents new difficulties, though, like over-voltage and stability issues, which could endanger the dependability and safety of the power supply. Energy management system (EMS) can increase efficient use of produced renewable energies. Thus, EMS contributes positively to solving the mentioned problems in networks. This paper proposes and presents an optimization-based energy management system for prosumers with PV panel and battery equipment located in small scale microgrids. The objective function is determined as to prosumer bill minimization ensuring maximum power injection to the grid.

Keywords: Energy management system, Microgrid, Optimization, Prosumer

LUNG CANCER DETECTION WITH MACHINE LEARNING SUPPORTED IMAGE PROCESSING TECHNIQUES

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ABSTRACT

Fast processes play an important role in the diagnosis of lung cancer. This study aims to develop a computer-aided diagnostic (CAD) system using machine learning algorithms and advanced image processing techniques. The dataset used contains computed tomography (CT) scans obtained from two different private hospitals in Iraq and considers healthy individuals as well as lung cancer patients at different stages of the disease. The process has three important stages. The first is initial image preprocessing to get better output and improve image quality, followed by segmentation and feature extraction to identify relevant features, show the diseased area, and finally feature selection to optimize the inputs and make the best choices for the classification stage . In the project, various machine learning algorithms such as random forest, decision trees and neural networks are tested to distinguish benign and malignant cases, and the most ideal classification method for the data set is selected. The performance of these classification methods is evaluated using metrics such as accuracy, precision, and F1 score to ensure the reliability of the system. This study aims to significantly increase the effective treatment of patients by contributing positively to the lung cancer diagnosis process.

Keywords: Lung Cancer Detection, Image Processing, CT Scan Analysis, Classification, Feature Extraction

SOLAR CHIMNEY POWER SYSTEMS AS A RENEWABLE ENERGY SOLUTION IN LIBYA

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ABSTRACT

This study investigates the potential of Solar Chimney Power Systems (SCPS) as a sustainable energy solution for Libya. SCPS technology leverages solar energy to drive air through a tall chimney, generating electricity via turbines, making it an attractive option for regions with high solar irradiance. This research proposes a system design optimized for Libyan conditions, particularly in Derna-Al-Fataih, where climatic and solar characteristics are conducive to efficient operation. An economic analysis, reveals promising financial metrics, including an annual revenue of $290,138, a net profit of $240,138, and a payback period of 6.25 years, resulting in a 16.01% return on investment (ROI). These results suggest that SCPS technology could provide a reliable and profitable renewable energy source for Libya, contributing to energy diversification and sustainability. This study addresses existing gaps in SCPS research and offers recommendations for future work on hybrid systems and region-specific adaptations.

Keywords: Solar chimney, Renewable energy, Hybrid energy systems, Libya

HEAT TRANSFER ANALYSIS IN A TRAPEZOIDAL CORRUGATED CHANNEL WITH CIRCULAR OBSTACLES AT DIFFERENT LOCATIONS

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ABSTRACT

Corrugated surfaces significantly improve heat transfer compared to straight channels [1, 2]. For this reason, these surfaces are widely used in many engineering applications, especially in heat exchangers [1-3]. It is reported that obstacles or turbulators placed inside corrugated channels increase heat transfer [4, 5]. The geometry of these obstacles and their location inside the channel significantly affect the flow and heat transfer. This study numerically analyzes the effect of circular obstacles placed at different positions in an asymmetric trapezoidal corrugated channel on the flow and heat transfer. Numerical solutions are carried out with the ANSYS Fluent program. The working fluid is air. There are adiabatic straight sections at the inlet and outlet of the channel. Trapezoidal corrugated surfaces are maintained at a constant temperature (Tw=340K). The study was applied for three different locations of circular obstacles (t: 7 mm, 9 mm and 11 mm) and four different Reynolds numbers (Re: 3000, 4000, 5000 and 6000). For these parameters, channel outlet temperature (Tout), heat transfer coefficient (h), Nusselt number (Nu) and heat transfer enhancement ratio (ER) in the channel were obtained and the results were presented in graphs. To observe the effects of channel geometry, circular obstacles and Reynolds number on flow and heat transfer, flow and temperature contours were obtained at different parameters. As a result of the numerical study, it was observed that heat transfer increased with the increase in channel inlet velocity. It was seen that the location of circular obstacles affected the flow and heat transfer. This study showed that if appropriate parameters were selected, obstacles placed in corrugated channels could significantly increase heat transfer.

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Keywords: Circular obstacle, Heat transfer, Trapezoidal corrugated channel

MODELING AND SIMULATION OF ELECTRIC VEHICLES: AN APPROACH USING MATLAB

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ABSTRACT

Electric vehicles (EVs) play an increasingly significant role in the automotive industry due to environmental concerns and the need to reduce dependency on fossil fuels [1]. This study focuses on modeling and simulating an electric vehicle system using MATLAB/Simulink. Key components of EVs, including the battery, electric motor, power converter, and vehicle dynamics, are analyzed and modeled in detail [2]. In the modeling process, lithium-ion batteries were chosen for the battery module, with an emphasis on charge-discharge characteristics and energy density [3]. A permanent magnet synchronous motor (PMSM) was selected as the electric motor, and its torque-speed relationship was dynamically modeled. For the power converter, vector control strategies were implemented for motor control [4]. The vehicle dynamics model was designed to account for external factors such as aerodynamic drag, rolling resistance, and gradient forces acting on the vehicle [5]. Simulation results provided a detailed analysis of performance parameters such as acceleration, energy consumption, and battery life of the electric vehicle. The flexible structure of MATLAB/Simulink enabled easy integration of different driving scenarios and battery capacities into the model. This study aims to contribute to the development of more sustainable transportation systems by offering an effective simulation environment for analyzing the performance of electric vehicles.

Keywords: Electric vehicle, Energy consumption, Vehicle modelling

FLOW AND HEAT TRANSFER IN AN ASYMMETRIC TRAPEZOIDAL DUCT WITH TURBULATORS

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ABSTRACT

Channels with wavy/corrugated surfaces, which are passive heat transfer improvement methods, have attracted great attention for a long time [1,2]. Corrugated channels provide significant improvement in heat transfer because they increase surface area [3]. Another passive method is the turbulators/obstacles added to channel [4]. The purpose of these turbulators is to direct the flow in a certain direction, improve flow mixing and increase heat transfer [5]. To date, heat transfer in wavy channels with different geometries with or without turbulators has been investigated by many numerical and experimental studies and as a result, it has been reported that significant improvements in heat transfer are obtained in these channels compared to straight channels [6-8]. In this study, a trapezoidal duct with asymmetric geometry was used and circular turbulators were placed inside the wavy channel. The heat transfer behavior of circular turbulators in three different diameters was investigated. The analyses were performed with the finite volume method and the standard k-ε turbulence model was used as the viscous model. The wavy surfaces of the channel were kept constant at Tw=340 K and the channel outlet temperature (Tout), convection heat transfer coefficient (h), Nusselt number (Nu) and heat transfer improvement rate (ER) were found at different Reynolds numbers (3000≤Re≤6000). The results were presented as graphs. The velocity and temperature images were obtained for different parameters in the channel and the results were discussed. In addition, the results were compared with the wavy channel without turbulators. As a result of the study, it was observed that heat transfer improved by increasing inlet velocity. It was seen that the circular turbulators added to the channel significantly affected the heat transfer and the heat transfer increased with the increase in the circular turbulator diameters.

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Keywords: Asymmetric trapezoidal duct, Heat transfer, Turbulator

ANSYS-BASED INTAKE MANIFOLD FLOW ANALYSIS: A COMPUTATIONAL FLUID DYNAMICS APPROACH

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ABSTRACT

The intake manifold plays a critical role in the efficient operation of internal combustion engines. Ensuring the uniform and homogeneous delivery of the air-fuel mixture to the engine significantly affects combustion quality and overall engine performance [1]. This study focuses on flow analysis of an intake manifold using ANSYS Fluent, aiming to examine pressure drops, flow uniformity, and turbulence in detail. The analysis began with the development of a CAD model of the intake manifold, followed by meshing. An adaptive mesh structure was employed in critical areas to enhance mesh quality and solution accuracy. The $k-\epsilon$ turbulence model, commonly used in computational fluid dynamics (CFD) simulations, was selected for turbulence modelling [2,3]. Operating conditions were simulated under varying engine speeds and load scenarios. Simulation results revealed irregularities and turbulence intensities in certain regions of the manifold. These factors disrupt the uniform distribution of air among the cylinders, potentially reducing engine efficiency. Additionally, variations in pressure drop and flow velocity indicated the need for further optimization in manifold design. This study highlights the importance of CFD-based analyses in the design and optimization of intake manifolds [4]. The robust simulation capabilities of ANSYS Fluent contribute to accelerating the design process and improving engine performance. Future studies are recommended to explore different geometric designs and material properties to enhance manifold efficiency further.

Keywords: Intake manifold analysis, Computational fluid dynamics, Engine performance optimization

DETERMINATION OF THE POTENTIAL INHIBITORY POTENTIALS OF SOME THIOSEMICARBAZONE COMPOUNDS ON GLYCOGEN SYNTHASE KINASE 3 ENZYME AS IN SILICO

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ABSTRACT

Glycogen synthase kinase 3 (GSK-3) is a serine/threonine kinase that regulates various cellular processes through its broad range of substrates, including glycogen synthase, β-catenin, Cyclin D1, and c-Myc. These substrates are integral to key functions like cell cycle progression, apoptosis, and glycogen metabolism. GSK-3 inhibits glycogen synthase activity by phosphorylating it, thereby modulating glycogen storage and utilization [1,2]. In the presented study, the binding potential of some thiosemicarbazone compounds to the active site of this enzyme was investigated by Molegro Virtual Docker software. In addition, detailed maps of the binding patterns of the molecules to the active site of GAPDH enzyme were obtained using Discovery Studio 2024 Client.

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Keywords: Glycogen synthase kinase 3, Thiosemicarbazone, Docking, Cancer

DEVELOPMENT OF CONDUCTIVE DEXTRAN BASED-ON CARDIAC PATCHES

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ABSTRACT

In this study, the aim was to develop modified dextran-based conductive cardiac patches that biomimicked heart tissue to prevent myocardial degeneration after acute myocardial infarction. With the scope of study, dextran and alginate natural polymer was modified with methacrylic anhydride. The resulting modified polymers were confirmed using Fourier Transform Infrared Spectroscopy (FTIR) and Proton Nuclear Magnetic Resonance Spectroscopy (1H-NMR). We synthesized methacrylated dextran and methacrylated alginate films with varying amounts of inductive graphene oxide (iGO) incorporated to impart electroconductive properties and Vitamine-E to enhance healing performance [1-3]. The cardiac films were prepared by crosslinking using UV methods in the presence of photoinitiator 2-hydroxy-4'-(2-hydroxyethoxy)-2-methylpriophenone (Irgacurre 2959) [4]. The development biomimicked cardiac patches were characterized FTIR, X-Ray Diffraction (XRD), conductivity analysis as well as in vitro swelling, and degradation tests [5]. The antioxidant activity of Vitamine E loaded cardiac patches were determined by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay [6]. The cytotoxicity of the dextran based cardiac patches was evaluated on L929 fibroblast cell line using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. The results suggest that the developed dextran based conductive cardiac patches exhibit promising potential for use as biomaterials in cardiac tissue engineering.

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Keywords: Modified Dextran, Cardiac Patches, Vitamine E, Antioxidant Activities

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SUSTAINABLE ENERGY SOLUTIONS WITH FOREST BIOMASS IN TURKEY

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ABSTRACT

Renewable energy sources are essential in addressing climate change, achieving energy independence, and meeting sustainable development goals Turkey has a significant potential for forest biomass thanks to its rich natural resources and large forest areas. Forest biomass is a renewable energy source obtained by using organic materials such as trees and plants in energy production. According to 2024 data, Turkey's forested areas cover about %29 of the total land surface and 6 million tons of oil equivalent energy is produced annually from forest biomass. Utilization of this energy source has the potential to meet the energy needs of local communities, while supporting environmental sustainability and reducing carbon emissions.

However, sustainable forest management practices are necessary, as there can be negative impacts such as overcutting. Sustainable forest management includes a range of strategies and practices for the conservation and efficient use of forest resources. In this context, forestry policies in Turkey aim to maintain the integrity of forest ecosystems to ensure environmental sustainability. Projects carried out by the General Directorate of Forestry focus on protecting the biodiversity of forests, promoting afforestation efforts and improving the health of existing forests.

Existing policies include laws and regulations to protect forest areas, incentives for biomass energy projects, environmental protection and rehabilitation programs. Turkey collaborates with the European Union and various international organizations to expand the adoption of renewable energy sources. This cooperation includes issues such as the transfer of innovative technologies and raising awareness of the local population.

In conclusion, sustainable management of forest biomass offers great opportunities for energy security and environmental sustainability. By taking the necessary steps to utilize the potential of forest biomass and achieve sustainable development goals, Turkey can increase its energy independence and support environmental protection efforts.

Keywords: Forest Biomass, Sustainable Energy, Energy Generation

CAN ARTIFICIAL INTELLIGENCE BE TRAINED TO ACCOUNT FOR THE GROWTH LAWS AND BIOLOGICAL PATTERNS INHERENT IN TREE GROWTH?

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ABSTRACT

This study addresses a fundamental question in artificial intelligence applications within forestry science: Can AI models effectively learn and incorporate inherent biological growth patterns and laws governing tree development? Through systematic evaluation of Deep Learning Architecture (DLA) implementations in forestry modeling, we identify two distinct methodological paradigms: conventional adaptive learning-based models and optimized DLA frameworks incorporating hyperparameter and regularization techniques. While AI models demonstrate superior statistical performance compared to traditional regression approaches, their evaluation in forestry science necessitates consideration beyond mere performance metrics, particularly regarding biological plausibility. Our analysis reveals that standard adaptive learning-based AI models, despite achieving high training accuracy, often exhibit overfitting tendencies and fail to capture fundamental biological relationships. In contrast, hyperparameter-optimized and regularization-optimized DLA models, incorporating customized network parameters, demonstrate remarkable capacity in maintaining biological fidelity while mitigating overfitting challenges. These optimized frameworks successfully predict tree attributes while preserving consistency with established dendrometric principles, effectively addressing the traditional 'black-box' limitations of AI models. The study concludes that through proper optimization techniques, AI models can indeed be trained to account for biological growth patterns, though their full potential in forestry applications remains to be explored as our understanding of their capabilities continues to evolve.

Keywords: biological reaslistic predictions, overfitting, hyperparameter-optimized and regularization-optimized DLA models

USE OF PROBALITY DENSITY FUNCTIONS TO PREDICT DIAMETER DISTRIBITIONS IN FORESTRY

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ABSTRACT

This study discusses the role of diameter distribution models in providing more detailed insights into forest stand structures, essential for sustainable forest management and product determination. Traditional yield tables used in forestry provide stand-level predictions for growth and yield but lack specificity at finer scales like diameter classes. The paper highlights that, especially in Turkey, inventory studies for forest planning do not produce data detailed enough to fully support sustainable forestry practices. Diameter distribution models, using probability density functions, allow for the estimation of stand components, such as tree count, basal area, and volume, by diameter classes.

By integrating stand models with diameter distribution models, it becomes possible to derive more granular predictions that can benefit forestry applications, including forest management and silviculture. These models enable enhanced accuracy in predicting stand structure variations, which in turn supports planning for a broader array of forest products. The study emphasizes that the implementation of diameter distribution models can help mitigate current limitations in sustainable forestry efforts by enabling data from inventory studies to be analyzed at the diameter step level. As a result, this modeling approach offers a valuable foundation for forest management activities, aligning forestry practices with sustainability goals.

Keywords: Probability density function, Diameter distrubition, model

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HEARING HEALTH AND OCCUPATIONAL SAFETY RISKS FOR CONSTRUCTION WORKERS

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ABSTRACT

Noise is a significant public health problem, especially in the auditory system, but also in general health. Workers with hearing loss face challenges in terms of personal safety. They are also at higher risk of work-related injuries and are more likely to be unemployed. Noise has become an increasingly important issue, and its effects are being discussed in many sectors. Noise, which can affect individuals in many cognitive, social, and physiological aspects, is important to address from many angles, especially since it is a large part of the working lives of construction sector workers. In noisy work environments, communication is critical for work performance and/or safety. It is known that noise negatively affects interpersonal communication and reduces work efficiency. It has been determined that the effects of noise are evaluated in many sectors, but there is no comprehensive research in the construction field in Turkey. Today, it is essential to determine the share of occupational health and safety practices applied in all business areas in the construction sector and the measures to be taken. Unlike businesses in the industry in general, activities in the construction sector are not always fixed and carried out in a single location. Therefore, noise levels are constantly changing. It is important to discuss the national regulations and assessments that address general occupational health and safety practices in relation to hearing health and noise, and the effects of these measures on hearing health. This review discusses the interactions of noise with hearing loss and tinnitus and the rules that workers must follow in this sector.

Keywords: hearing loss, noise, workplace health and safety, civil engineering

HEALTH PROFESSIONAL DOULAS INTERVENTIONS AND BIRTH STYLE: A PILOT STUDY

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ABSTRACT

The aim of the study was to examine the selection rate of interventions performed by health professional doulas and the types of births accompanied by doulas. The universe of the study consisted of birth records where vaginal birth was planned by the physician and the pregnant woman and where births were accompanied by a doula (N=49). 47 records kept by professional doulas were retrospectively analysed. The variables of the study were the techniques applied by the doula and the mode of delivery. Of the births accompanied by a doula, 44 (93.6%) were vaginal, 2 (4.3) were cesarean, and 1 (2.1%) was vaginal after cesarean Doulas used medical techniques more than communication techniques or complementary techniques. The most common practices used by mothers to facilitate labor were breathing exercises and massage. The least preferred practices were music and shower. It was determined that approximately half of the pregnant women were nulliparous and that the doula practices performed according to the type of birth were similar. The number of cesarean sections and vaginal births after cesarean sections, which are too low to be statistically calculated, are clinically significant outcomes. This research is also important because it presents the content and effects of free services provided in a public hospital.

Keywords: Doulas, Parturution, Vaginal Birth after Cesarean

SWOT ANALYSIS OF THE THERAPY USE OF ÇANKIRI ROCK SALT MINE IN HEALTH TOURISM

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ABSTRACT

This study presents a SWOT analysis of the Çankırı Rock Salt Mine's potential for health tourism through salt therapy. With its unique natural resources and rich cultural heritage, Çankırı offers a promising environment for alternative therapies. The analysis identifies the region's strengths, such as its therapeutic mineral-rich salt, accessibility, and growing interest in natural remedies. It also highlights weaknesses, including infrastructure challenges and lack of awareness. Opportunities for growth include increasing health consciousness and government support, while threats encompass competition and economic fluctuations. This study aims to provide strategic insights for developing Çankırı as a prominent destination for health tourism.

Keywords: Health Tourism, Salt Therapy, SWOT Analysis, Çankırı Rock Salt Mine, Alternative Therapies

INVESTIGATION OF MIDWIVES' SATISFACTION WITH SUPPORTIVE PERSONNEL ASSIGNED TO VAGINAL BIRTH AND THEIR PRACTICE: MIXED METHOD RESEARCH

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ABSTRACT

The objective of this study is to evaluate the satisfaction of midwives with the level of support provided by the personnel assigned to vaginal births. The population of the research will be midwives working in the hospital to provide medical care. Given that the research is a focus group interview, it was decided that 12 participants would be appropriate. The following questions were posed: "Does the supportive staff communicate correctly with the hospital staff and the pregnant woman?", "Did the supportive staff pay attention to the guidance of the delivery room midwives in the selection of the pregnant woman?", and "Are you satisfied with this practice?" In terms of the communication skills of the supportive staff, 53.85% of the participants rated them as very good, while 46.15% rated them as good. In regard to the attention paid by the supportive staff to the guidance provided by midwives in the selection of pregnant women, 66.67% of the participants responded that it was very good, while 33.33% indicated that it was good. With regard to their satisfaction with the practice, eight participants answered "very good," three answered "good," and one answered "bad." The majority of participants expressed satisfaction with the practice and the conduct of the supportive staff. Qualitative analysis revealed that some support staff were perceived to disregard working hours and provide inadequate assistance to pregnant women. This reduces the midwife's workload, aligning with the anticipated outcomes. However, the research also illuminated the underlying issues.

Keywords: Personal Satisfaction, Midwifery, Qualitative Research

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THE ROLE OF BIOMASS ENERGY IN SUSTAINABLE DEVELOPMENT AND ITS CONTRIBUTION TO ENVIRONMENTAL SUSTAINABILITY GOALS

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ABSTRACT

As one of the main components of sustainable development models, bioenergy has the potential to create innovative and environmentally friendly alternatives in energy production as a means of supporting economic growth and making significant contributions to achieving biological survival goals. Biomass energy plays a critical role in achieving sustainable development and contributes significantly to environmental sustainability goals. As a prominent source of energy production in developed countries, biomass is derived from various biological sources such as agricultural residues, wood chips, animal wastes and energy crops. In a developed nation, approximately 342 million tons of biomass are utilized annually, fulfilling around 5% of the energy demand. This includes the use of corn grain for ethanol and wood or wood residues for heat and electricity. By increasing biomass production threefold, the country could generate an estimated 60 billion gallons of low greenhouse gas emission liquid fuel, all while still satisfying the future needs for food, animal feed, fiber, traditional forestry products, and exports. Untapped biomass resources have the capability to significantly expand the nation's bioeconomy, potentially adding around 350 million tons of additional biomass annually, in addition to current levels. In a fully developed market in the future, sources like energy crops could supply more than 400 million tons of biomass each year. However, the analysis emphasizes sustainability, considering possible impacts on soil, air, and water quality, while also ensuring the protection of biodiversity. The technological processes used to convert biomass into energy include various methods such as incineration, pyrolysis, gasification and anaerobic digestion. The environmental benefits of biomass, such as its carbon neutrality and potential to reduce fossil fuel dependency, as well as its ability to provide energy access in rural areas and stimulate local economies, are important components of this study. Furthermore, the capacity of biomass to meet rural energy needs in developing countries and to make it more efficient through modern biomass technologies is a key focus of this study. In conclusion, it is emphasized that in order to fully realize the potential of biomass to achieve sustainable development goals, environmental and economic challenges need to be addressed in collaboration with managers, scientists and industry.

Keywords: Biomass Energy, Sustainable Development, Environmental Impact

AN INVESTIGATION OF THE EFFECT OF CUPPING (AL-HIJIMA) ON HEMATOLOGICAL, AND LIPID PROFILE PARAMETERS IN MISSAN PROVINCE/ SOUTH IRAQ

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ABSTRACT

This research investigated the impact of cupping therapy on hematological and lipid profile parameters in patients in Missan Province, South Iraq. The study involved 50 patients, primarily suffering from chronic conditions like obesity, high fat levels, joint pain, and headaches. The results demonstrated that cupping led to a significant increase in red blood cell and white blood cell counts, particularly after 30 days of treatment. The results showed that there was a significant increase in the rate of red blood cells after cupping for people compared to before cupping. A group recorded 4.83 ×106/ mcl after 10 days of cupping. /mcl, while the cupping group after 20 days recorded 5.07 ×106/ mcl, as well as the cupping group after 30 days recorded 5.17 ×106/ mcl, while the group before cupping recorded 4.60 ×106/ mcl. The results showed that there was a significant increase in the number of white blood cells before and after the cupping procedure, as cupping led to improving the immune system by increasing the number of white blood cells, especially after 30 days of cupping, where a significant difference appeared, as 8.24×103 cells/µl /were recorded compared to 6.44×103/ cells/µl before the cupping procedure. While hemoglobin levels showed a slight increase, PCV values exhibited a slight decrease. Platelet counts decreased significantly after 10 and 20 days of cupping but returned to baseline levels after 30 days. Notably, cupping significantly reduced total cholesterol, triglycerides, and LDL levels, while increasing HDL levels. The results showed that there were significant differences in the values of total cholesterol before and after cupping for 10, 20, and 30 days. The results confirmed a significant reduction in the values of total cholesterol after cupping for the three times, as the values decreased to 209.08, 162.02, and 149.80 mg/dL. The patient group recorded 234.24 mg/dL before cupping and respectively. The results confirmed the presence of significant differences in the values of total triglycerides before and after cupping. The results indicated a significant decrease in the values of total triglycerides 10, 20, and 20 days after cupping, as they were recorded at 147.08, 153.18, and 157.40 mg/dL respectively compared to 179.50 mg/dL before cupping. The results confirmed that there are significant differences in the LDL values for the four groups studied before and after cupping, as the groups recorded 10, 20, and 30 days after cupping a significant decrease in the LDL rate, as they recorded 117.34, 113.28, and 103.66 mg/dL, respectively, compared to 134.14. mg/dL before cupping. The results showed that there were significant differences in HDL values before and after cupping. The results indicated a significant increase in HDL values after cupping at 10, 20, and 30 days, amounting to 41.70, 43.50, and 45.98 mg/dL, respectively, compared to 32.21 mg/dL before cupping. These findings suggest that cupping therapy may have beneficial effects on hematological and lipid profiles, potentially contributing to improved overall health.

Keywords: Cupping, Hematological, lipid profile, Missan province

THE DUAL ROLE OF LIVER ENZYMES IN THE DIAGNOSIS AND MONITORING OF NAFL

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ABSTRACT

Non-alcoholic fatty liver disease (NAFLD) has emerged as a major global health concern, often leading to significant morbidity and mortality. Liver enzymes, including alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP), are routinely measured in clinical practice. While these enzymes are traditionally used to assess liver function, their role in diagnosing, monitoring, and prognosis NAFLD is increasingly recognized. The results showed that there is a significant difference between the mean patient age of the two groups studied (control group and patient groups), the patient group was significantly excellent in the mean patient age which recorded 61.83 years as compared with 44.20 years for healthy persons in the control group. The results showed that the age groups above 70 years significantly outperformed the rest of the age groups in the prevalence of the disease, reaching 36%, followed by the age group 60-69 years, which recorded 30%, while the age group less than 30 years has not recorded any infection with the disease is 0%. The results presented that the average cumulative glucose concentration (HbA1C) achieved a significant increase in the patient group, amounting to 6.37% compared to 4.96% for the control group. The results indicated that the patient group was significantly superior to the control group in terms of a significant increase in the ALT level (67.11 vs. 34.60) U/L. The results revealed that the patient group was significantly superior to the control group in raising the average AST value to 39.22 U/L compared to 16.82 U/L for the control group. Data showed that there is a significant difference in the values of ALP levels between the two groups studied, but the patient group was significantly superior in raising the ALP values to 77.50 U/L compared to 49.60 U/L for the control group.

Keywords: NAFLD, ALT, AST, ALP

A DISPOSABLE ELECTROCHEMICAL IMMUNOSENSOR FOR GLY DETECTION

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ABSTRACT

Glycodelin (GLY) is a glycoprotein with a molecular weight of 47 kDa and was reported as a new and important endometrioz biomarker [1]. The levels of GLY have been found to be significantly elevated (>39 ng mL-1) in endometriosis patients compared to in healthy women (5-31 ng mL-1). GLY concentrations have been reported to be 30% higher than normal levels in stages I and II, and 40-50% higher in stages III and IV [2,3]. Therefore, sensitive detection of GLY biomarker by label-free antibody-based biosensors is of great importance for early detection of various cancers. In this study, a label-free GLY immunosensor was prepared for sensitive, low-cost and rapid detection of GLY using hand-made electrodes. First, hand-made electrodes were prepared using screen printing method. The surface of working electrode (WE) was first deposited with gold nanoparticles (AuNP) using CV method. To prepare label-free GLY immunosensors, SPCE/AuNP modified electrodes were modified with 6-mercapto hexanoic acid (6-MHA), EDC-NHS, Anti-GLY, BSA and GLY, respectively. Electrochemical characterization of the prepared GLY immunosensors were performed by CV, DPV and EIS. The preparation steps of the label-free GLY immunosensor are given in Figure 1. Optimization of experimental parameters (antibody concentration, antibody and antigen incubation times) of label-free electrochemical GLY immunosensors were performed by DPV and EIS methods. Analytical characterizations of GLY immunosensors with wide linear range and low detection limit were performed. Selectivity, regeneration and real sample studies were also carried out. The disposable GLY immunosensors developed are fast and practical candidates for use in point-of-care testing.
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Keywords: GLY, immunosensor, hand-made electrode

IMPACT OF DEMOGRAPHIC TRAITS ON RISKY DRIVING BEHAVIORS

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ABSTRACT

The leading cause of vehicle accidents is attributed to human factors, particularly risky driving behavior. This study aims to examine the driving behaviors of a sample of drivers while exploring the demographic factors—such as age, gender, driving experience, and type of vehicle—that may influence these behaviors. Utilizing a quantitative research approach, the study employs descriptive analysis techniques and t-tests to compare various participant groups. The analysis involved 108 Indonesian drivers, and the findings suggest that both age and gender significantly contribute to the propensity for risky driving behaviors, including speeding, lane changing, and overtaking other vehicles. Specifically, the results indicate that male drivers are more likely to engage in such risky behaviors compared to their female counterparts. Additionally, an interesting trend emerges regarding age: as drivers grow older, their likelihood of participating in risky driving behaviors diminishes. This research highlights the critical role that demographic factors play in understanding and addressing risky driving, with implications for targeted interventions aimed at reducing accidents on the road.

Keywords: Demographic, Human factors, Indonesian drivers, Risky driving

INVESTIGATION OF MICROPLASTICS POLLUTION IN WILDLIFE THROUGH OWL PELLET

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ABSTRACT

Microplastic pollution is a pervasive global environmental problem affecting ecosystems and pose a potential threat by entering the food chain. Due to their small size, microplastics are easily ingested by organisms at the base of the food web. Owls, as nocturnal predators, that hunt small vertebrates such as mammals, reptiles, and birds, play a critical role in ecosystem functioning. Their diverse foraging strategies and wide nesting ranges, makes them vulnerable to microplastic bioaccumulation through their prey. The aim of this study is to assess microplastic exposure in owl by analyzing the content of owl pellets. Pellets of the Long-eared owl (Asio otus) were collected from three different habitats in Ankara, including agricultural, steppe and forest areas. The samples were prepared using a method that involved heating the pellets 10 minutes at 60 °C, followed by treated with 10% KOH at 55 °C for 75 minutes to extract microplastics and prey remains. After organic material removal, identification and and microplastic particles, all the identifications and microplastic classification and classification of microplastics were conducted under a stereomicroscope. Preliminary results from 292 pellllet samples revealed four types of microplastics film (%6), fragments (%7), silicone (%1) and fibre (%86), with the fiber being the most abundant. Microplastics were most prevalent in pellets from the steppe habitat, with microplastics ranging in size from 469 µm- 4 mm. The diet analysis indicated that Harting's vole (Microtus hartingi) was the most common prey species across habitats. This is one of the first studies to investigate microplastic pollution in relation to owl diet, providing valuable insights into trophic transfer of microplastics in wildlife ecosystems. This study was supported by the TÜBİTAK, Project no: 124Z216.

Keywords: Fibers, Microtus hartingi, Asio otus, Wildlife, Pellet

INTEGRATION OF GAS CHROMATOGRAPHY MASS SPECTROMETRY ANALYSIS OF PHYTOCHEMICALS IN ZIZIPHUS JUJUBA TAREGTING MULTIDRUG RESISTANT SHIGELLA SPECIES COMPLEMENTED BY MOLECULAR DOCKING STUDY

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ABSTRACT

Antibiotic resistance emerging at the rate that surpass the development of new class of antibiotic. This study was conducted to explore the antimicrobial activity of Ziziphus jujuba extract against multi-drug resistant Shigella species. In-vitro antibacterial activity was assayed using agar diffusion technique. Total biochemical profile of the extract was screen using Gas Chromatography Mass Spectroscopy (GC-MS) analysis. In silico molecular docking was employed to determine activities of the compounds against PDB ID: Ix7i and the binding energies identified the potency of the compounds. The results demonstrated significant inhibitory effects using methanol solvent their 11.00mm at 25ml/dl, 11.00mm at 50ml/dl, 7.00mm at 75ml/dl and 7.00mm at 100ml/dl respectively. The result obtain from on the docking results CID-537118 had the best binding of -7.89kcal/mol and was analyze to interact with 1 hydrogen bond each with Lys32, (distance = 2.84Å). Likewise, CID-12760132 possess the binding affinity of -7.31kcal/mol interacting 2 hydrogen bonds with Lys32 (distance = 3.02Å) and Ser10 with (distance = 2.56Å), CID-56634694 has a binding energy of -7.30kcal/mol which interact with RNA dependent RNA polymerase via 2 hydrogen bond with Lys32 (distance = 2.98Å) and Ser10 with (distance = 2,55Å), Compound with Pubchem I.D of CID-101771, has binding energy of -7.25 kcal/mol and was examined to interact with via 2 hydrogen bond with Tyr228(distance =2.47Å) and Lys32 (distance =2.89Å). Compound with Pubchem I.D of CID-537118, has binding energy of -7.29 kcal/mol and was examined to interact with via 1 hydrogen bond with Tyr228 (distance =2.88Å). Compound with Pubchem I.D of CID-985, has binding energy of -5.00 kcal/mol and was examined to interact with via 1 hydrogen bond with Lys32 (distance =2.84Å) and Lys32 (distance =2.89Å). The results underscore the potential of Ziziphus jujuba as a potential source of source of bioactive compound with antibacterial activity and could be considered as an alternative therapeutic strategies and candidate for drug development.

Keywords: Multidrug resistant, Ziziphus jujube, Shigella, Molecular docking, In-vitro evaluation

PREDICTIVE MAINTENANCE SYSTEMS FOR OPTIMIZING RELIABILITY IN RENEWABLE ENERGY EQUIPMENT

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ABSTRACT

Predictive maintenance has emerged as a vital technology for ensuring the operational efficiency and longevity of renewable energy equipment, including solar panels, wind turbines, and energy storage systems. This study proposed an advanced predictive maintenance framework powered by machine learning and IoT-based sensor networks. By leveraging real-time data from equipment sensors and historical performance metrics, the system identifies patterns and predicts potential failures before they occur, thereby minimizing downtime and reducing maintenance costs. The system employs machine learning techniques, including Gradient Boosting and Long Short-Term Memory, to analyze sensor data and identify anomalies effectively. A significant innovation of this approach is the combination of supervised and unsupervised learning methods to address both labeled and unlabeled datasets, enabling more accurate fault detection and root cause analysis. Furthermore, the framework integrates edge computing to perform local data processing, ensuring timely insights even in remote installations. Preliminary results indicate the system's ability to reduce maintenance costs by 20% and improve equipment availability by 15%. Artificial intelligence (AI) is increasingly recognized as a transformative force in optimizing the reliability and maintenance of renewable energy systems. AI-driven predictive maintenance utilizes machine learning algorithms to analyze sensor data and historical performance, enabling early fault detection and the prevention of equipment failures [1]. This proactive strategy not only reduces downtime, additionally extends the lifetime of equipment and produces major savings on expenses. Techniques such as deep reinforcement learning have demonstrated promise in optimizing operation and maintenance decisions, surpassing traditional methods [2]. Additionally, artificial neural networks (ANN) have been applied to health condition prediction in wind turbine systems, facilitating a shift from time-based to condition-based maintenance strategies [3]. Despite these advancements, challenges persist. Issues such as data quality, feature engineering, interpretability, and security concerns remain key hurdles [4]. However, the integration of artificial intelligence in energy efficiency maintenance is evolving with the potential to impact the development of worldwide power systems while contributing to a more environmentally friendly and effective energy environment.

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Keywords: Multidrug resistant, Ziziphus jujube, Shigella, Molecular docking, In-vitro evaluation

TRANSFORMATION OF FOOD WASTE INTO ADSORBENTS AND METHYLENE BLUE DYE REMOVAL

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ABSTRACT

Pollution caused by dyes from industrial processes poses serious environmental threats to aquatic ecosystems and increases the need for sustainable water treatment methods. This study focuses on examining the utilization of food waste as low-cost and environmentally friendly adsorbents. It is observed that common food wastes such as orange peels, coffee grounds, and eggshells can be used for the adsorption of methylene blue (MB) from water by optimizing their surface properties through chemical activation processes. Characterization procedures typically involve Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), and surface area analyses. Adsorption performance is assessed by exploring parameters such as solution pH, temperature, initial concentration, and contact time. The results demonstrate that adsorbents derived from food waste exhibit high adsorption capacity and provide an effective solution for methylene blue removal.

Keywords: Food waste, Methylene blue, Adsorption, Environmental sustainability, Biosorbent

INFLUENCE OF ADDITIVES ON CALCIUM SULFATE CRYSTAL SIZE AND MORPHOLOGY

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ABSTRACT

In this study, the effects of additives on the crystal size and morphology of calcium sulfate were examined through a literature review, and the findings were compiled and evaluated. It is well-known that the properties of calcium sulfate vary significantly due to the influence of various additives during its crystallization from solution, thereby altering its performance in various industrial and scientific applications. Studies in the literature investigate the effects of additives such as surfactants and polymers on the nucleation and growth mechanisms of calcium sulfate crystals. Notably, significant changes in crystal morphology are observed depending on the chemical structure of the additives. The knowledge gained from this review contributes to the production of calcium sulfate crystals with desired properties and the optimization of related processes.

Keywords: Crystallization, Calcium Sulfate, Additive

NOVEL ENERGY GENERATION FROM THERMAL GRADIENTS IN DENİZLİ CITY

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ABSTRACT

Denizli, Turkey, is renowned for its abundant geothermal resources, making it an ideal location for harnessing thermal gradients to generate clean energy. This study investigates the potential of utilizing thermal gradients in Denizli through advanced technologies such as Organic Rankine Cycle (ORC) power plants and thermoelectric systems based on the Seebeck effect. The Seebeck effect, which converts temperature differences directly into electrical energy, is highlighted as a key mechanism for efficient and sustainable energy generation. Thermoelectric generators (TEGs), leveraging materials like bismuth telluride and silicon-germanium, offer significant potential for converting geothermal heat into electricity without emissions or moving parts. The study evaluates the technical feasibility of implementing these systems, considering Denizli's geothermal resources, such as the Karahayit and Pamukkale springs. It also explores the integration of Seebeck-based technologies to enhance the utilization of low-temperature geothermal gradients, enabling more efficient energy production. Key parameters like temperature levels, source depth, and thermal flow rates are analyzed to optimize energy output. Preliminary findings indicate that combining ORC and Seebeck-based systems can significantly boost energy production while reducing carbon emissions. This dual approach not only supports Turkey's renewable energy targets but also positions Denizli as a model for sustainable energy innovation. This research underscores the importance of geothermal resources and thermal gradient technologies in achieving energy sustainability, providing a scalable and eco-friendly blueprint for clean energy generation in Denizli and beyond.

Keywords: Thermal Gradients, Denizli, Organic Rankine Cycle (ORC), Carbon Emission Reduction, Eco-Tourism

COMPARISON AND PERSPECTIVE OF SODIUM ION AND LITHIUM ION BATTERY

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ABSTRACT

In recent years, the demand for lithium has surged, and limited global lithium reserves have caused the price of lithium compounds to rise significantly. Sodium (Na), one of the most abundant elements on Earth, offers a viable alternative [1]. Sodium's natural abundance in the Earth's crust is 2.8%, making sodium carbonate (Na_2CO_3) resources significantly cheaper compared to lithium carbonate (Li_2CO_3) [1], [2]. Sodium-ion batteries (SIBs) have the potential to fill this gap as a sustainable alternative to existing battery technologies. When examining the abundance of transition metals, lithium (Li) and cobalt (Co) stand out as two of the least abundant, with concentrations in the Earth's crust at 20 ppm and 25 ppm, respectively. In contrast, nickel (Ni) is relatively abundant, available at 84 ppm [2]. Additionally, there are a variety of commercially available sodium-based sources that support electrode labeling. Sodium-ion batteries (SIBs) and lithium-ion batteries (LIBs) operate on similar principles. However, Na has a larger atomic and ionic radius than Li; Na^+ ions are 0.26 Å larger than Li^+ ions. This size difference can lead to variations in the formation of solid electrolyte interfaces (SEIs), affecting the portability, phase stability, and elasticity of SIBs [1]. In addition to differences in electrode materials, another notable variation between LIBs and SIBs is the choice of current collectors. In LIBs, aluminum (Al) foil is typically used as the current collector for the cathode, while copper (Cu) foil is used for the anode. This is because lithium forms an alloy with aluminum at lower potential, which could lead to performance issues. Between the electrodes, a porous separator with electrolyte solution is placed to prevent short circuits [2], [3]. SIBs adopt a similar architecture, but with a key difference: aluminum foil can be used as the current collector for both the anode and cathode, as sodium does not form an alloy with aluminum at lower potentials. This substitution of lithium with sodium and copper with aluminum could reduce the cost of SIBs; however, it would increase the overall mass and volume of the battery system compared to LIBs. Achieving cost-effectiveness in terms of $/kWh is critical for the commercial viability of battery technologies, especially in applications targeted toward end users [2]. Energy density of a SIB is mostly lower than LIB [4]. Generally speaking, the use of sodium, which has a low price, high availability and relatively low energy density, may increase in the coming years. Especially with the spread of electric vehicles, limited lithium resources and inefficient recycling processes, finding an alternative to lithium is a necessity.

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Keywords: Li-ion Battery, Failure, Battery Fire, Intervation

THE NEW TRENDS IN OPTODE APPLICATIONS AND TECHNOLOGY

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ABSTRACT

Optodes have emerged as indispensable chemical and biological sensing tools, offering unparalleled versatility, sensitivity, and non-invasive operation. Recent advancements in material science, nanotechnology, and optoelectronics have significantly enhanced optodes' functionality and application range. In addition to their robust applications in environmental monitoring and industrial processes, optodes have gained significant traction in biochemical sensing [1, 2]. ,They are increasingly used for detecting biomarkers such as glucose, lactate, and oxygen in blood, as well as for real-time monitoring of enzymatic reactions and cellular activities. These capabilities have made optodes essential in areas like personalized healthcare, drug discovery, and metabolic studiesv[3]. This review provides an in-depth exploration of the latest trends in optode technology, focusing on novel materials, integration with digital technologies, and advancements in multi-analyte sensing. It also examines their expanding roles in environmental monitoring, healthcare diagnostics, biochemical sensing, and industrial processes, addressing both current challenges and future opportunities in optode research and development[4].

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Keywords: Optode, Sensors, Biochemical sensing, Chlorimetric sensing.

THE ROLE OF POLYMERIC ADDITIVES IN CALCIUM CARBONATE CRYSTALLIZATION

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ABSTRACT

This study examines the effects of polymeric additives on calcium carbonate crystallization based on existing research in the literature. Calcium carbonate is a widely used material in various fields such as biomineralization, construction, pharmaceuticals, and the paper industry, with its crystal morphology and size significantly influencing its performance in these applications. Literature studies extensively address the impacts of organic and inorganic additives on the nucleation, growth mechanisms, and polymorphic distribution of calcium carbonate. Specifically, it has been noted that polymer additives induce significant changes in morphology and polymorphic distribution through their specific binding to crystal surfaces. This review contributes to the literature by providing insights into the production of calcium carbonate crystals with desired properties and the optimization of related processes where polymers are used as additives.

Keywords: Calcium carbonate, Additive, Crystallization

TARGETING REPROGRAMMED GLUCOSE METABOLISM IN CANCER THERAPY

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ABSTRACT

Cancer cells alter their metabolic processes to fulfill the demands of rapid growth and to thrive in diverse microenvironments. The acceleration of glycolysis not only meets their energy needs but also supplies intermediates for biosynthetic pathways, enabling the production of essential molecules such as proteins, lipids, nucleotides, and fatty acids [1,2]. This metabolic reprogramming is closely tied to key cancer traits, including uncontrolled cell growth, resistance to apoptosis, metastasis, and the formation of new blood vessels. Enzymes like hexokinase, phosphofructokinase-1, and pyruvate kinase, which are upregulated during these processes, have emerged as promising targets for cancer treatment [3]. This study delves into the altered glucose metabolism in cancer cells and discusses its potential for therapeutic manipulation.

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Keywords: Glucose, Cancer, Cancer Treatment, Metabolism

OPTIMIZED ANALYSIS OF GREEN HYDROGEN PRODUCTION BY ELECTROLYSIS FOR ÇANKIRI SALT RESOURCES

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ABSTRACT

This study evaluates the potential of utilizing Çankırı's abundant salt resources for renewable energy production with a specific focus on green hydrogen generation. Particularly, hydrogen production through the electrolysis of salt emerges as an environmentally friendly and sustainable energy solution. During the electrolysis process, when combined with water, sodium and chlorine components are separated, resulting in the production of high-purity hydrogen gas. This method offers a significant opportunity in terms of both low carbon emissions and the utilization of local resources. Çankırı's natural salt reserves provide a robust foundation for this type of energy production. Leveraging these resources not only enhances the region's energy production capacity but also reduces dependency on fossil fuels. Moreover, hydrogen has a wide range of applications, including energy storage and transportation, so making it a versatile energy carrier. This development has the potential to not only strengthen Çankırı's local economy but also contribute significantly to Turkey's renewable energy goals. The electrolysis process not only offers substantial advantages in terms of environmental sustainability but also allows for the byproducts, such as chlorine and other secondary materials, to be utilized in the chemical industry and other multidiscipliner fields. Consequently, this optimized analysis for green Hydrogen production can enrich both energy and industrial sectors. In conclusion, achieving hydrogen production by effectively utilizing Çankırı's existing salt reserves represents a major opportunity to advance energy transition and sustainable development at both local and national levels. In this context, the proposed method could serve as a starting point for Çankırı to become a model city in innovative energy production.

Keywords: Çankırı Energy Potential, Green Hydrogen Production, Salt Electrolysis, Sustainable Energy

BLOCKCHAIN AND THE NUCLEAR SUPPLY CHAIN: THE TRACKING TECHNOLOGY OF THE FUTURE

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ABSTRACT

The transportation and tracking of nuclear materials has become one of the leading areas of study in recent years. Nuclear material transportation includes many important parameters, such as sustainability, security, and transparency. Many factors (temperature, time, etc.) are critical in the transportation and tracking of these materials. This study focuses on the use of blockchain technology in nuclear material transportation. The security of the processes can be increased by using blockchain technology in nuclear material supply processes. An example architecture is presented based on the results of the studies conducted in the literature. In addition, the benefits that blockchain can provide and its usability in nuclear material transportation are evaluated. The main purpose of this study is to present how efficient blockchain technology can be in nuclear material transportation. The study has shown that nuclear material transportation using blockchain technology can significantly contribute to transportation methods.

Keywords: Blockchain, Nuclear Material, Tracking, Supply Chain, Transportation

COMPARATIVE ANALYSIS OF FLOATING AND GROUND-MOUNTED PHOTOVOLTAIC SYSTEMS: PERFORMANCE, ENVIRONMENTAL, AND ECONOMIC PERSPECTIVES IN ISTANBUL

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ABSTRACT

This study conducts a comparative analysis of floating and ground-mounted photovoltaic (PV) systems in Istanbul, Turkey, focusing on their performance, environmental impact, and economic feasibility. Using PV-SOL Premium 2021 software, both systems each with an installed capacity of 154.8 kWp are simulated under identical climatic conditions. Performance metrics such as energy yield, specific yield, performance ratio (PR), CO_2 emission reduction, and financial outcomes are evaluated. Results show that the floating PV system outperformed the ground-mounted system, generating 200,467 kWh/year with a PR of 96.0%, compared to 190,260 kWh/year and a PR of 88.0% for the ground-mounted system. The superior performance of the floating system is attributed to reduced operational losses and enhanced cooling from the water surface. Additionally, the floating PV system demonstrated greater environmental benefits, offsetting 94,209 kg of CO_2 emissions annually, compared to 89,412 kg/year for the ground-mounted system. Despite these advantages, economic analysis revealed that neither system achieved financial profitability over a 20-year period. Both required an initial investment of 3,771,367 ₺, resulting in negative net cash flows of -2,419,049.15 € for the floating system and -2,465,071.37 € for the ground-mounted system. Furthermore, the floating PV system had a slightly lower electricity cost (1.03 ₺/kWh) compared to the ground-mounted system (1.09 ₺/kWh). These findings highlight the technical and environmental superiority of floating PV systems while emphasizing the critical need for subsidies, incentives, and supportive policies to enhance their financial feasibility and promote widespread adoption.

Keywords: Floating photovoltaic systems, Ground-mounted PV systems, Renewable energy

PROTEIN-LIGAND DOCKING FOR COMPUTER-AIDED DRUG DISCOVERY (CADD)

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ABSTRACT

Protein-ligand docking has emerged as a cornerstone technique in computer-aided drug discovery (CADD), facilitating the identification and optimization of potential therapeutic compounds. This computational approach predicts the preferred binding orientation of a ligand within the active site of a protein receptor, providing insights into molecular interactions critical for drug design. The process involves receptor and ligand preparation, docking simulations, and scoring functions to evaluate binding affinities. Advances in docking algorithms and scoring methodologies have enhanced accuracy, making it possible to screen vast chemical libraries and prioritize drug candidates efficiently. Applications of protein-ligand docking include lead identification, structure-based drug design, and the optimization of binding properties to improve efficacy and selectivity. Moreover, docking studies have proven instrumental in understanding the molecular basis of disease and accelerating the drug discovery pipeline. Despite its limitations, such as scoring inaccuracies and the challenge of accounting for receptor flexibility, docking remains an indispensable tool in modern pharmaceutical research [1, 2]. Future advancements in computational power and integrative approaches promise to further revolutionize protein-ligand docking, bridging the gap between theoretical predictions and experimental validation.

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Keywords: Molecular docking, Protein, Ligand, CADD

BIOCOMPOSITES AS ALTERNATIVES TO SYNTHETIC FIBER COMPOSITES: TYPES, PRODUCTION METHODS, AND MECHANICAL PROPERTIES

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ABSTRACT

Global issues such as the depletion of resource reserves, environmental pollution, and economic concerns have shifted the focus of research across various disciplines. The concepts of recycling and sustainability have become ubiquitous across all sectors, leading to significant advancements in various economic aspects. In recent years, advances in nanotechnology and composite materials have led to major developments in the material sector. Composite materials have replaced metals to a certain extent in our daily lives. However, the desire for a cleaner world has spurred the idea of replacing the synthetic products used in these materials with natural ones. In recent years, researchers have examined natural fibers or polymers and investigated their usability. Researchers widely examine biocomposites based on their fiber matrix content, production methods, and application areas. This review presents an overview of existing natural fibers, categorization of biocomposites, mechanical properties, and production methods.

Keywords: Biofiber, Biopolymer, Recycling, Sustainability

MEETING COMMON AREA ENERGY NEEDS IN MULTI-DWELLING BUILDINGS WITH PHOTOVOLTAIC (PV) PANELS: DESIGN AND CALCULATIONS

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ABSTRACT

In recent years, PV (photovoltaic) electricity generation has been installed especially on the roof areas of newly meeting the energy consumption of independent housing sections is not preferred very often due to insufficient roof space. However, the use of roof space for common areas of housing is frequently preferred. Increasing energy unit prices, together constructed buildings; in order to meet the energy consumption for common areas. In multi-storey residential buildings, with the necessity of electric vehicle charging station systems in parking areas, have increased the energy costs of common areas of housing. Although PV energy systems are suitable for increasing energy costs, the installation cost of PV systems is also high. For this reason, it is inevitable that calculations and designs for PV systems should be made with high precision accuracy. In this study, the design of photovoltaic (PV) electricity energy systems for multi-storey residential buildings is discussed. The installed power and demand power calculations, which are mandatory in the project preparation stages of the buildings, were made on the basis of the electric power table in the common areas and the necessary calculations were performed. In line with the demand power calculations, the energy power, number of panels, inverter capacity, cable sections of the PV system were calculated and a 2D design was created in the AutoCAD program. Then, the connection elements of the designed PV system to the main distribution panel inside the building were calculated and integrated into the design. As a result, the applicability of PV electrical energy systems in common areas of multi-storey residential buildings was demonstrated. The use of such systems has great potential in terms of environmentally friendly energy production and low energy costs. In addition, it will contribute to energy efficiency in future building projects by providing an important step towards sustainable energy solutions. In the future, equipping more buildings with such systems will be an important development in terms of energy independence and environmental sustainability.

Keywords: 2D Desing, AutoCAD, Photovoltaic(PV), Power Calculate, Sustainable Energy

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