# 4th International Congress of Engineering and Natural Sciences Studies

## Abstracts Booklet

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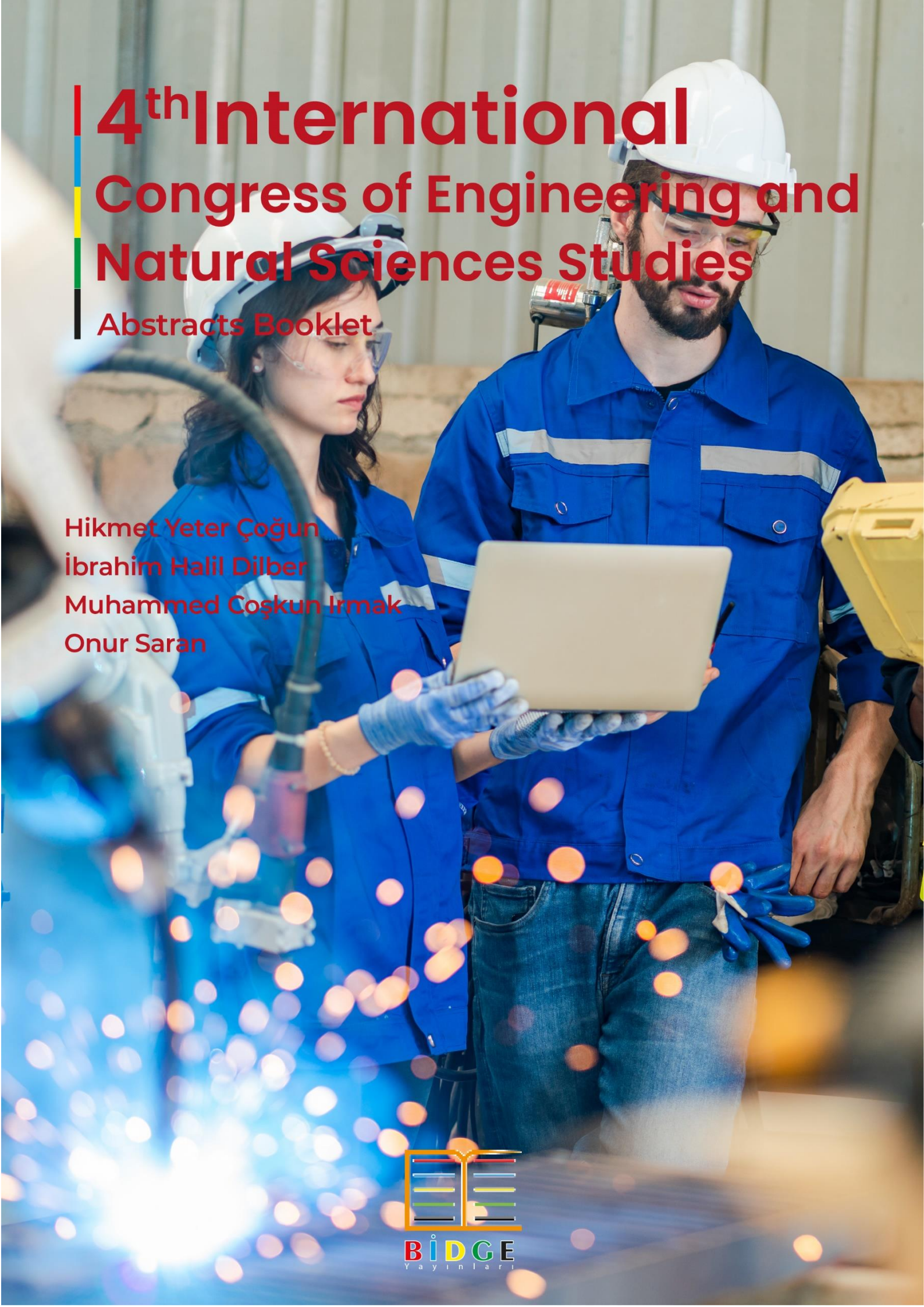

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# 4th International Congress of Engineering and Natural Sciences Studies

# Abstracts Booklet

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# Contents

# ABSTRACTS

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# Simulation-Assisted Production Studies of Fastener with Deep Allen Form

*Alper BAYGUT*[1]
*Aslıhan KALYON*[2]
*Yener YILMAZ*[3]
*Furkan BELLİBAŞ*[4]

## Abstract

In this study, simulation-assisted design of a specialized fastener known as a "plug bolt," featuring a deep allen form, is conducted to explore boundary conditions. Additionally, research is undertaken on prototype production using the cold forging method. The primary reasons for preferring the cold forging method for parts include achieving superior surface quality with reduced processing, enabling mass production at room temperature within tight dimensional tolerances and it can be listed as homogeneous material flow distribution compared to other production methods. In the study, the design of the cold forging process, based on part volume conservation, preferred the application of back extrusion mechanics that proceed gradually in forming the deep allen form. During the gradual formation of deep allen forms, there is a risk of tearing, folding, and rupture in the inner area fibers, as well as splitting in the head area. These undesired structures may lead to internal hexagonal stripping and premature breakage of the bolt head. To preempt undesirable situations in production, simulation studies were conducted beforehand. During the simulation exercise, it was established that the plastic forming of the part was homogeneous, with the compressive stress on the mould where the deep allen form was shaped measuring 1417 MPa, while the tensile stress was 470 MPa. The study revealed a 97% compatibility between the 2D-3D design, simulation analyses, and dimensional outputs of prototype products. Consequently, parts were manufactured meeting the specified requirements.

**Keywords**: Simulation, Deep Allen, Cold Forming, Plastic Forming

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# 'Structural Analysis And Topology Optimization Of Vehicle's Suspension System

*Umut Can TANDOĞAN*[1]
*Kerimcan ÇELEBİ*[2]
*Orhun ÇAĞLAR*[3]

## Abstract

In recent years, increasing technological developments have greatly influenced the automotive industry. In a competitive environment, companies try to reduce costs and workforce quantities. Topology optimization comes into play at this stage. The general purpose of topology optimization is to reduce the weight of the existing and used product when designing a new product, and to obtain an idea about the dimensions of the new product to be designed as a result. Reducing weight in vehicle production contributes extra to the vehicle's fuel consumption and performance values, as well as enabling manufacturers to produce more economical vehicles, giving the company an advantage in competition with other firms. In this study, structural analysis and topology optimization were carried out using the ANSYS program on control arm, steering Knuckle, and tie rod parts, which are important components in the suspension systems of passenger vehicles, without compromising their strength and performance in order to reduce mass. The parts used in the analysis were designed using Aluminum 6082 T6 and Steel EN8 materials, and all structural analyses were performed using the properties of these materials. The main models analyzed were drawn using CATIA V5 software, saved in STP format, and transferred to the ANSYS program. The models obtained after Topology Optimization were then saved as STP files and imported back into CATIA V5 software. After Topology Optimization, a weight reduction of 1.27 kg was achieved in the control arm part with a 32% savings, 2.018 kg in the steering knuckle part with a 40% savings, and 0.707 kg in the tie rod part with a 22% savings. The models were then refined to be suitable for manufacture using CATIA V5.

**Keywords:** Topology optimization, Structural analysis, Control arm, Steering knuckle, Tie rod

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# Numerical Investigation and Theoretical Validation of Convective Heat Transfer in Turbulent Pipe Flow

*Muhsin KARAKAŞ*[1]
*Hakan KARAKUŞ*[2]
*Gökhan CANBOLAT*[3]

## Abstract

The heat transfer performance of in-pipe flows can be examined with fast and reliable calculations through Computational Fluid Dynamics (CFD). CFD Analysis are highly used in the industry and engineering to assess the fluid flow and heat transfer. The main purpose of the study is to investigate heat transfer performance under different operating conditions. In this study, numerical calculations are performed via CFD to investigate the turbulent convective heat transfer characteristics in the pipe flow under constant heat fluxes and different Reynolds (Re) numbers. The cases are carried out by three different Reynolds numbers (10000, 20000, and 30000) and under different heat fluxes (5000 and 1000 kW/m$^2$). The pipe diameter and length are accepted as 50 mm and 1000 mm, respectively. The fully developed flow condition is considered in this study. The Nusselt number is calculated numerically, and it is verified theoretically by using the Dittus Boelter equation. The mesh independence test is performed according to validation value of the Nusselt number. The Nusselt number is converged by CFD results to a relative error of 1.86% for 10000 Reynolds number. According to CFD analysis, the increase in Reynolds number also increases the heat transfer coefficient. On the other hand, the temperature at the surface decreases by increasing the Reynolds number. As a result, Reynolds number is a significant parameter in heat transfer performance. It is concluded that the Nusselt number is not affected by constant heat fluxes under constant thermos-physical properties, and it is compatible with the theory.

**Keywords:** Pipe Flow, Convective Heat Transfer, CFD, Turbulent Flow

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# Glass Mold Analysis and Design Using Finite Element Method to Achieve Optimal Cooling Condition

*Mehmet Umut ŞENGÜL*[1]
*Ramazan Murat TABANLI*[2]

## Abstract

In today's competitive glass industry, the fast heating and cooling of glass molds are of paramount importance. This study focuses on the production of tea glasses in the glassware sector, primarily using the press-blow method. In the press-blow manufacturing process, the initial shaping mold is called the 'blank mold,' and the semi-finished product it forms is referred to as the 'parison.' Subsequently, the semi-finished product is given its final shape in the 'blow mold.' The ability of the blow molds to dissipate heat evenly is crucial for the product formation process and the quality of the final product.
Efficient cooling of the blow molds can significantly enhance the surface quality of the products and accelerate the production process. Furthermore, the design of appropriate cooling holes can extend the lifespan of the molds and reduce maintenance costs. In this study, thermal analyses were conducted using finite element methods to optimize material selection and geometry of cooling holes located at the base of the molds. Various mold materials commonly used in the industry were analyzed using FEM. Additionally, the positions and sizes of the cooling holes were optimized to achieve more homogeneous and effective cooling within the mold.
As a result, this study aims to enhance product quality by achieving optimal cooling of the blow molds used in tea glass production through thermal analyses and optimization studies. Such efforts are crucial for gaining a competitive advantage and improving product quality in the glass industry.
**Keywords:** Glass, glass manufacturing, blow mold, thermal analysis, finite element method

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# Occupant Classification System in Automotive Seats

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## Abstract

In today's world, safety systems have become a crucial focus area in the development of automobiles. The utilization of airbags is essential for ensuring passenger safety, preventing many injuries and fatalities. However, improper airbag deployment can lead to injuries and deaths among vehicle occupants. Fatal accidents involving inappropriate airbag usage are more commonly observed in particularly infants and children passenger classes. Therefore, a new law was introduced in the United States in 2004. The law stipulates that if a child under the age of 6 is seated in the passenger seat, the airbag system in the vehicle must be deactivated and prevented from deploying. Automotive manufacturers developed the technology called Occupant Classification System (OCS) to enchance the passenger safety in the event of a crash. The main objective of the OCS is to improve the effectiveness of safety features within vehicles, particularly airbags. By accurately identifying the seating positions and characteristics of passengers, it ensures appropriate deployment or deactivation of airbags during a crash, thereby enhancing overall safety. This OCS technology distinguishes between childs and infants seated in the passenger seat and prevents injuries and fatalities that may occur due to the deployment of the airbag system in the event of a collision. This paper focuses on the OCS technology developed to enhance driver and passenger safety in the automotive sector. It will discuss what OCS technology in automotive seats is, how it operates, and will also address the importance of these systems in the automotive industry and their potential for future development.

**Keywords:** Vehicle Crash, Airbag, Occupant Safety, Occupant Classification System (OCS), Occupant Detection System

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# Emboss Process in Automotive Seats

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## Abstract

An aesthetic appearance is one of the most important customer expectations in today's vehicles. The seats, which cover a large area in the vehicle and are in direct contact with the user, are among the components of critical importance in meeting this aesthetic expectation. Vehicle manufacturers aim to create a more aesthetic appearance by adding effects such as shapes, patterns and embossing to the seat covers of vehicles. The relief effect on seat covers of different types and colors can be achieved with applications called emboss. In these applications, the lamination sponge, which is a layer of the seat cover, is thinned using different methods. Thus, a relief effect is achieved in areas where the lamination sponge is not thinned. The most commonly used emboss applications by vehicle manufacturers are; The embossing process with hot layer is basically divided into three: embossing process with high frequency (electro-welded) and calender processing. Since the mentioned methods create the relief on the seat cover using different technologies, all three applications have their own usage areas, advantages and disadvantages. For this reason, vehicle manufacturers make a choice between hot layer, high frequency and calender processes, taking into account different parameters such as the shape, pattern and design of the relief they want to apply on the seat cover. In this study, different emboss methods were examined and compared with each other, taking into account parameters such as performance, applicability and cost. For this purpose, literature research was conducted and the information obtained from the studies carried out so far was compiled.

**Keywords:** Automotive, Vehicle Seat, Seat Cover, Fabric, Emboss

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# Optimizing Rotor Design To Improve An Acoustic Anomaly in Bldc Motor

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**Abstract**

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# Abrasion Evaluation of Seat Upholstery Under Heat and Humidity Conditioning by Colour Measurements

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## Abstract

In the automotive industry, textiles are used in many places and components within the vehicle. The car seat is one of the most important components where textile is used. Seat has different parts such as backrest, cushion, headrest and armrest. These textiles, namely upholsteries, are technical textiles and are produced in many varieties such as woven, knitted, leather and non-woven surfaces. Since the vehicles are outdoor products, the seats may be exposed to abrasion, heat and moisture for long times. At the same time, since it is a component that the user comes into direct contact with, it has many expectations in terms of both aesthetics and functionality. Therefore, there are many performance expectations from seat upholsteries, and many tests and evaluations are applied to seat upholsteries in order to simulate the use of the end user. The most important of these is exposure to abrasion, heat and humidity. The most important aspect is to protect of the upholsteries' current status. This study was focused on the comparison of upholstery exposed to heat and moisture before abrasion. In the experimental research, images of each sample were taken and the differences in colour coordinates were compared. The results were reported as colour differences to investigate the effects of external factors on seat upholstery.

**Keywords:** Automobile seat upholstery, Conditioning of seat upholsteries, Abrasion, Colour measurement, Colour difference, Stereoscope measurement

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# Heating and Cooling System Design and Simulation in Ansys Analysis Environment

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*Mustafa İlyas İPEK*[2]

## Abstract

Heating and cooling systems are vital inventions for humanity. Widely used in daily life and industrial areas, these systems are constantly being improved to increase energy efficiency and functionality. Air conditioning systems used in vehicles play an important role in providing thermal comfort for the driver and passengers. However, the lack of sufficient product diversity in the market for heating and cooling systems used in vehicle headrests has necessitated the start of new studies in this field. Due to the dense nerves in the neck and nape of the human body, it is thought that even a mild stimulation applied to this area can create the desired effect. In this context, it is aimed to increase thermal comfort while driving by providing slightly warm or cool air to the user's neck area with a system integrated into the headrests. For this purpose, airways and assembly parts were designed using CATIA V5R20 Program. The designed model was then subjected to flow and thermal analysis in the Fluent module of ANSYS 2024R1 Package Program under specified initial conditions. According to the results of the analysis, the air temperature and velocity it blows is important for not disturbing the user. In accordance with the requirements of the ECE R-17 standard, the headrest must meet certain structural durability criteria. According to the Ford Motor Company ST-0903 test, the maximum displacement and strength of the headrest are determined under the influence of a load imposed on the headrest in a given geometry. As a result, the headrest must be designed to meet certain durability and functionality criteria. In this context, the heating and cooling system made with the use of specified materials such as Polyproethylene (PP) shows the strength to meet the maximum load without plastic damage according to the ANSYS Mechanical analysis results.

**Keywords:** Seat, Headrest, Climate Systems, PTC Plate, ANSYS Analysis

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# Electron Beam Evaporated Deposition of Ti/Pt Layers as CMUT MEMS Device Electrodes

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## Abstract

Electron beam evaporation of platinum (Pt) by using photoresist layers for lift-off patterning is challenging. Typical evaporation temperature is ~1500 °C, at ~$10^{-6}$ Torr pressure. It is not easy for photoresists to withstand these temperatures for long. To overcome the temperature challenges, a set of microfabrication steps are developed to evaporate 100 nm titanium (Ti) as adhesion layer, and 100 nm of platinum as the second metal layer of the electrodes of CMUT (Capacitive Micromachined Ultrasonic Transducer) MEMS (Microelectromechanical System) devices. Pyrex substrate is cleaned with standard procedures. Then, the substrate is kept for 30 minutes on a plate at 150 °C to remove water molecules from the substrate. Then, 50 nm of Cr is blanket deposited. Cr serves as an adhesion layer for AZ 4562 photoresist. Next, HMDS (HexaMethylDiSilazane) is spun on the 50 nm Cr coated substrate to enhance the adhesion for AZ 4562. The photoresist is patterned using the standard procedures to define the regions for deposition of titanium and platinum electrode stack. It is necessary to condition the photoresist for the high temperatures. Photoresist is exposed to Ar RIE (Reactive Ion Etching) for a total of 13 minutes with 1 minute cycles. Between each cycle the substrate is taken from the RIE chamber to let the photoresist to cool down. Cooling down repetitively, helped with hardening of the photoresist for the high temperature depositions. Titanium is deposited in one step. Platinum is deposited in 20 nm deposition cycles. Between each deposition, the evaporator is cooled down for 45 minutes. After depositions, the substrate is immersed in acetone to perform the lift-off process to obtain the electrodes. Finally, the Cr is etched to have only the electrode materials on the substrate.

**Keywords**: evaporation, e-beam, platinum, MEMS, CMUT

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# The Effect of Seat Position on the Driver's View

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## Abstract

The main objective of ergonomics research in the automotive industry is to identify possible ergonomics problems in early phases. Companies avoid financial losses by correcting issues before they reach production stage. The use of human modeling in ergonomic analysis started in the 1950s. Digital human models have been created as a result of technological advancements in human modeling. Nowadays, RAMSIS and JACK are the most popular digital human modeling software programs.

Many studies have been carried out on vehicle ergonomics. These include topics such the ideal driving position prediction software, the ideal driver seat design, and driver's view. Nevertheless, there isn't one study that focuses at the relation between driver's view and vehicle seat position.

In this study, the effect of vehicle seat position on driver's view was examined. Analyzes were carried out using the Jack 9.0 for the driver's view performance. Two different digital human models (DHMs) which called 50% male and 5% female utilized for the evaluations, as these models are still frequently used in ergonomics researches today. For these digital human models, three distinct seat positions—designated 1, 2, and 3—were established. The driver's view was examined by placing digital human models in the selected seat positions. As a result of the analysis, the effect of seat position on the driver's view was determined and detailed in the study.

**Keywords**: Ergonomics, View, Digital Human Model, Virtual Analysis, JACK

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# Energy Consumption and Cost Comparison of Air-Cooled and Single-Phase Immersion Liquid-Cooled Data Center White Spaces

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## Abstract

The aim of this study is to compare energy consumption and cost of an air-cooled data center white space and a single-phase immersion liquid-cooled data center white space. There are few studies on single-phase immersion liquid cooling and comparison of both cooling types for data centers. In this study, two different data center white spaces are designed in Istanbul with the same 4 MW IT load. In the first system, IT equipment is located inside racks and data center environment is kept at 24°C in order to cool the IT equipment. CRAH units supply cold air with water coil inside. In the second system, IT equipment is immersed in tanks, filled with dielectric fluid. CDU units, which are embedded in tanks, cool the dielectric fluid with a water coil inside. Fluid loop interacting with air is adjusted to 18°C-24°C whereas fluid loop interacting with dielectric fluid is adjusted to 26°C-32°C. Considering ASHRAE data for Istanbul, both systems will require free cooling chillers but liquid-cooled system will use free cooling at greater range of ambient temperatures than air-cooled system, decreasing the total consumed power of free cooling chillers. In the end of this study; utilizing immersion liquid cooling decreases energy consumption for cooling and operating cost of cooling elements by %24 but increases investment cost of cooling elements by %56 compared to air cooling. It creates a more energy efficient data center environment, but with a higher cost that can redeem in 17 years.

**Keywords:** Data center, air cooling, single-phase immersion liquid cooling, energy consumption, cost

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# Future Technology In Vehicles; Hcci (Homogenous Charge Compression Ignition) Engines

*Cenk SAYIN*[1]

## Abstract

Nowadays reducing fuel consumption of the cars and exhaust gas emissions has become a necessity for both countries and users. Because of this the scientists have begun in new researches. It is well known that gasoline engines have advantages in terms of exhaust emission, but diesel engines have advantages in terms of fuel consumption. Today the new trend is that; during the preparation of the charge which is taken into the cylinder is the application of ignition engine which is homogenous charge compression that for those two combined engine mixture. Homogenous charge compression ignition (HCCI) combustion process occurs neither flame front as spark ignition engines, nor diffusion flame as compression ignition engines. In this new technology; combustion starts in every points of combustion chamber at the same moment. Since the realization of combustion in this way, engine performance will increase while NOx and particle matter (PM) emission decreases. HCCI engines have misfiring and knocking problems at low load and high load respectively. However HCCI combustion can be achieved with leaner mixture and high thermal efficiency can be obtained. In this study, it is aimed tos here current applications in HCCI engines and to investigate future research areas of this technology.

**Keywords:** Internal combustion engine, Engine performance, Exhaust emissions, HCCI

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# Vırtual And Experımental Investıgatıon Of Hvac Ihx Component Performance Under Wltp Condıtıons

*Mustafa DEVECİ*[1]
*Osman SÜMER*
*Göktuğ GENÇELLİ*

## Abstract

In this study, it is aimed to verify the vehicle 1D HVAC model created with the Simcenter Amesim program through vehicle tests. During this verification, the thermal performance evaluation of the air conditioning system using R1234yf refrigerant, with and without IHX, was carried out. While establishing the Amesim 1D model, each component was calibrated separately and then the system was checked. In vehicle tests, while the air conditioning system was operating at maximum performance, the vehicle was brought to different speed levels. In this way, the real usage situation of the vehicle is simulated. The IHX effect was examined by calculating the subcooling, superheating values, PH diagram and COP value with the data received. These values were compared with virtual simulation and vehicle level tests, and the accuracy of the virtual model was examined. As a result of the studies, it was observed that the IHX component increased the COP value of the system by 4.73% and the superheating value by an average of 12.1 (˚C).

**Keywords:** IHX, 1D Simulation, Subcooling, Superheating, Cooldown

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# Investigation of Stress Corrosion Behavior of AISI 304L Stainless Steel Welded by TIG Welding

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## Abstract

Thanks to their attractive properties such as high strength and fatigue resistance, excellent resistance to corrosion and weldability, AISI 304L stainless steels are widely used from the production of medical equipment in the healthcare sector, including the automotive sector, to the food, chemical and marine sectors, from the construction sector to heating and cooling systems. However, it is known that the 18% Cr element in AISI 304L stainless steels forms CrC precipitates at the grain boundaries during welding and causes stress corrosion cracks because of the stresses applied to the welding area. In this study, 2 mm thick AISI 304L stainless steel samples were joined by TIG welding. Stress corrosion behavior and microstructures were investigated, and hardness, tensile, and bending properties were determined. The hardness value in the central region of the TIG welded samples was determined to be a maximum of 280 HV due to rapid cooling. According to the tensile and three-point bending results, the tensile strength was determined as 605 MPa, and the bending strength was determined as 1650 MPa. Before the stress corrosion test, the sensitized samples were kept in solution for 168, 192, 360, 384, and 408 hours and crack measurements were made. According to the test results, the maximum crack formation in the samples was 1212.3 µm in the sensitized that was placed in solution for 408 hours. When evaluated in terms of stress corrosion behavior, it was determined that the crack propagation of the samples without sensitization was lower, and the crack propagation increased with the increase of solution time.

**Keywords:** AISI 304L, TIG welding, Stress Corrosion, Hardness, Tensile and Flexural stress.

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# Analysis of Temperature Gradient and Thermal Stresses of Variable Thickness Composite Annular Fin

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*Kerimcan ÇELEBİ*[2]
*Ali YILDIRIM*[3]
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## Abstract

Fins are studied widely with different cross-sections and profiles by using various analytical and numerical methods in recent years. Due to its cost and its heat efficiency comparing with the other types, in this paper, an annular fin with various cross-sectional profile made by composite materials where particle reinforcements are thought to be homogeneously distributed in the matrix which has reached its steady state thermally has been analyzed for temperature gradient and thermal stresses. Thermal and mechanical properties are constant in the annular fin. The thickness of annular fin is changing linearly along the radial direction. In this annular fin, thermal distribution and thermal stresses are intended to achieve by using Pseudospectral Chebyshev Method (PCM). Validation of this method was ensured by comparing it with the analytical solution of the constant thickness annular fin that found in the literature. It has been observed that very sensitive and accurate results are obtained with PCM. In the light of the validation of PCM, the effect of the thickness on temperature distribution and thermal stresses was observed. According to the study in the literature for constant thickness, the thermal stresses along the radial axis are nearly same at the base of the fin however it has been observed that different results occur towards the tip of the annular fin.

**Keywords:** Annular fin, thermal stresses**,** Pseudospectral Chebyshev Method

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# Electricity Generation by Raising the Temperature Level with the Novel Modified Geothermal Energy Sourced Kalina Cycle System Design

*Aslı TİKTAŞ*[1]

## Abstract

Geothermal energy stands out as a renewable resource, offering the requisite high temperatures for clean, uninterrupted, and cost-effective electricity production. Various studies explore integrating geothermal sources with different systems for power generation. The Kalina cycle, particularly adept at utilizing waste heat at medium temperatures, exhibits significant promise. Its efficacy lies in exploiting ammonia's low evaporation point to enhance water vapor performance and minimize heat transfer losses. Consequently, integrating robust systems like the Organic Rankine cycle, gas turbines, fuel cells, and S-$CO_2$ cycles enhances electricity generation capacity. However, existing literature primarily focuses on maximizing net electricity output without addressing waste heat source temperature elevation. Elevating the source temperature could markedly enhance electricity production efficiency and cost-effectiveness. Addressing this gap, this study proposes a novel electricity generation system utilizing a geothermal-based Kalina cycle. In this system, ammonia vapor from the evaporator undergoes condensation, pressure elevation via a pump, and a second evaporation process. Mixing this vapor with water in the mixing chamber yields an ammonia vapor-water solution at temperatures exceeding those of the geothermal source. Passing this solution through a separator facilitates electricity production with ammonia vapor, while the ammonia and water streams return to the first evaporator, completing the thermodynamic cycle. This novel approach promises enhanced electricity generation efficiency and economic viability.

**Keywords:** Geothermal energy, Kalina cycle, electricity production, waste heat recovery, cost-effective energy systems

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# Causes and Precautions of Noise in Modern Automobile HVAC Systems

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## Abstract

The heating, ventilation, and air conditioning system (HVAC) is one of the most important systems affecting the comfort of a modern passenger car. One of the biggest obstacles to the efficient operation of this system, which provides air circulation in the cabin and allows the user to adjust the climatic characteristics of the environment (humidity, temperature, etc.) according to his wishes, is the noise generated by the mentioned systems. Noise can occur in heating, ventilation, and air conditioning systems for a variety of reasons (for example, noise created by components when operated, vibrations from the systems themselves or from external sources such as road profiles, or various irregular sounds created by air flow and air passage in ducts). Just as noise adversely affects the comfort of the vehicle driver and passengers, some noise causes (such as vibrations) can shorten the life of components of heating, ventilation, and air conditioning systems or neighboring systems or shorten vehicle maintenance intervals. In addition, many studies conducted by healthcare professionals have proven that constant and/or high exposure to noise levels has a negative effect on both the mental and physical health of exposed people. For these reasons, when designing heating, ventilation, and air conditioning systems, engineers make their designs to minimize noise sources and prevent noise generation above the healthy limit in the long term. The aim of this study is to provide information to the reader about the main causes of noise occurring in the heating, ventilation, and air conditioning systems of a modern vehicle, the basic measures taken to prevent noise, and how these measures affect the noise.

**Keywords:** HVAC, noise, airflow, vibration, comfort

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# Using Natural Fiber in Automobile Parts

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## Abstract

The ever-growing demand for lighter, more fuel-efficient, and environmentally friendly vehicles is pushing the automotive industry towards innovative materials. Natural fiber composites, composed of plant-based fibers like flax, hemp, and sisal embedded in a polymer matrix, are emerging as a promising alternative to traditional materials. This review paper examines the current state of development and applications of natural fiber composites in the automotive sector.The review highlights the key benefits of these composites, including their lightweight nature, good specific strength, and excellent thermal and acoustic insulation properties. Additionally, natural fibers are renewable, biodegradable, and often less expensive than conventional materials, contributing to a more sustainable automotive manufacturing process.The paper also explores the challenges associated with using natural fibers in composites. These can include lower overall strength and stiffness compared to synthetic fibers, as well as susceptibility to moisture absorption. However, ongoing research is addressing these limitations through improved fiber treatment methods and novel matrix formulations.Overall, the review concludes that natural fiber composites hold significant potential for various automotive applications. With continued research and development, these eco-friendly materials can play a crucial role in achieving lighter weight, improved fuel efficiency, and a more sustainable future for the automotive industry.

**Keywords**: Natural fibers, eco friendly, renewable, automotive,plant-based

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# Improvment Quality of Plastic Granuls

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## Abstract

Plastic pollution is a growing concern, and enhancing plastic recycling is crucial for a sustainable future. This paper proposes a process design approach to achieve two key objectives:Improved Quality of Plastic Granules and Enhanced Recycling and Product Quality after Conversion. This study focuses on optimizing the recycling process to yield high-quality plastic granules. This may involve strategies like advanced sorting techniques, contamination control measures, and potentially incorporating innovative cleaning or decontamination technologies. Additionally, the paper explores methods to ensure the recycled plastic retains its properties after conversion into new products. This could involve optimizing conversion processes like extrusion or injection molding, potentially including techniques like blending virgin and recycled material in controlled ratios or exploring novel processing technologies that improve the quality of recycled plastic products.The paper will discuss the challenges associated with maintaining quality throughout the recycling chain, from plastic waste collection to final product. It will then present the proposed process design, outlining the key steps and technologies involved in achieving both high-quality plastic granules and superior quality in the final converted product. Finally, the paper will touch upon the potential benefits of this approach, including environmental advantages, cost reductions, and the creation of a more closed-loop plastic economy.

**Keywords**: plastic recycling, process design, quality improvement, plastic granules, recycled products

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# Design Validation on 3D CAD Modelling of a Passenger Vehicle Dashboard

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## Abstract

Design validation is a control process carried out as part of the design process. Basically, it is used to determine whether a design produces the desired results. It carefully evaluates every aspect of the design to identify and eliminate potential problems in advance, thereby improving the quality and usability of the final product. Therefore, design validation is one of the key elements in developing a reliable and functional product. The state of the gap between the parts, whether the parts are engaged or not, and the preliminary evaluation of the assembly process (controls such as whether the connectors are conveniently mounted, component placement, and the order of installation) are carried out in this step. To do this, prototypes, simulations, or similar methods can be used. The assessments are important for the post-design processes of the component to be manufactured and for post-sales processes such as the replacement of parts in multiple component systems. It directly affects the ease and duration of installation, defines the operator's job, and facilitates the unmounting process. The dashboard is a critical component that significantly affects the interior design of the vehicle as well as the comfort of the driver and passenger. Over time, its design and functionality have been significantly improved, with the integration of new technologies and features enhancing the vehicle experience and becoming a multi-functional control center. Together, the dashboard complex has become an important unit with many parts, and the verification process is important for the user because it carries vital parts for the user's safety. The aim of this study is to inform the reader about the design validation of a model dashboard.

**Keywords:** conceptual design, design validation, montage feasibility, component integration, dashboard design

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# Living Hinge Design on Automative Glovebox Mechanism

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*Gökçe EKEN* [3]
*Cem İÇİER* [4]

## Abstract

One of the most important units of today's vehicles, the dashboard is equipped with various components that provide the driver and other users with information and ease of driving. One of these components is the glovebox, which is located on the passenger side and is used to store various items that the user needs. Each glovebox has a hinge mechanism that prevents the weight caused by the objects in it or the force exposed to it while the vehicle is in motion from opening the box lid. This mechanism can be easily turned on by the user when needed. The user's movement is transmitted to the lock by this mechanism, enabling the glovebox to be locked, opened, and closed. Depending on the type of mechanism, they can be single- or double-hinged. The double-hinged mechanisms consist of five to nine parts, depending on the construction of the mechanism. Significant amounts of time, materials, money, and labor are spent on the design of the mechanism and the mold, on the production process, and finally on the assembly line. A new type of single-component mechanism, which meets all requirements, has been designed and optimized through the necessary tests to prevent these expenditures. This new mechanism is designed using a special geometry called the "living hinge" which provides the transmission of the motion provided by the user. The revised mechanism, which describes the design process and important structural characteristics in this article, has saved time and resources while preserving the capabilities of the previous system and its use while reducing assembly and production processes.

**Keywords:** progressive design, part reduction, living hinge design, fatigue life, stress analysis

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# A Component Design Initiative to be Used for Flow Lamination in Automotive Ventilation System

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## Abstract

HVAC is an acronym for "heating, ventilation, and air conditioning" and refers to systems used to control atmospheric properties such as temperature, humidity, air quality, and air flow in various indoor spaces. Heating, ventilation, and air-conditioning systems, also found in modern cars, are used to provide comfort to what is inside the vehicle and to maintain a comfortable driving experience. The speed and direction of air flow from the heating, ventilation, and air-conditioning systems are left to the user through a set of controllers to enhance the comfort of the driver and passenger. The user controls these parameters through components called "air vents" at the end of each ventilation line and various buttons usually located in the middle of the dashboard. Air vent components use the wing-like parts they have to direct the air coming from the air canal to where the user wants it. For the current direction to be effectively altered, the current coming from the air canal must be laminar or as close as possible to the laminar current (i.e., the current with regular flow lines). In modern vehicles, the character of the flow is shaped by the size and geometry of the air canal. This may affect the construction of the air canal and cause it to be large enough to cover too much volume or to make it difficult to achieve the desired output. With a new plug-in for air channels, the work is being introduced in order to facilitate the lamination of air flows and overcome the above-mentioned disadvantages.

**Keywords:** HVAC, airflow, flow charachter, flow seperator, lamination

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# Replacement of Some Cross-Car Beam Parts with a Lighter Material in a Vehicle

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## Abstract

The trend toward electric vehicles in the automotive industry is increasing day by day. Transitioning to electric vehicles requires adding batteries to vehicles, which also causes an increase in vehicle weight. This weight increase negatively affects vehicle fuel consumption, performance, and sustainability. To solve this problem, automobile companies try to reduce the weight of some vehicle components. For example, the cross-car beam, which ensures structural integrity within the vehicle and provides the fixing of some components such as plastic parts in the cockpit and the steering column, is traditionally produced from steel material. The cross-car beam made of steel has a heavy and bulky structure. Therefore, any development in this area will positively affect the weight of the car. Using lighter materials such as carbon fiber or lightweight alloys like aluminum instead of traditional steel provides similar strength while weighing less. Therefore, studies are being carried out on the use of alternative materials in this cross-car beam. In this paper, a study on removing some metal brackets on the cross-car beam and using plastic-reinforced carbon fiber material instead will be examined in terms of the integration of the carbon fiber-reinforced plastic part into the cross-car beam, the weight reduction achieved as a result of the study, and the virtual and physical tests required to integrate this study into a vehicle.

**Keywords:** Electrical vehicle, weight reduction, cross-car beam, carbon fiber, sustainability

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# SOC Estimation of Lithium – Ion Batteries with Unscented Kalman Filter

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## Abstract

Global warming, climate changes and decreasing fossil fuel reserves in response to rapidly increasing energy needs have pushed people to seek alternative energy sources. The ongoing need for transportation has highlighted electrical energy as an alternative and paved the way for investments in this field.

With the increase in the use of electric vehicles, battery packs with high energy and capacity have begun to be produced and used. This situation has brought about some precautions in terms of security and usage precautions. One of the issues that should be taken into consideration is the charging status information in the vehicles.

Increasing interest in electric vehicles in recent years has made charge status estimation algorithms a trend. This is important in terms of monitoring the discharge/charge cycle in the battery and calculating the range based on the remaining energy. If the calculation is incorrect, the cycle life may be calculated incorrectly, loss of battery capacity may occur, or dangerous situations may occur as a result of overheating.

In this study, SOC was estimated and examined with the help of Unscented Kalman Filter created in Matlab - Simscape.

Kalman Filter has a filtering feature like conventional prediction algorithms. In addition, it estimates and updates values that cannot be measured in the system based on the previous value. When deviation from the real value occurs, the algorithm returns the estimated values to the real position quickly and noiselessly. Although the Kalman Filter is a very successful estimator in linear systems, improvements have been made for non-linear systems and as a result, an Unscented Kalman filter has been created. Unlike EKF, it does not require linearization in systems and makes an approximate calculation from random state values with the Gaussian variable.

In the study, the estimated inferences (wşth UKF) were compared with OCV calculations and the effect of environmental temperature on the relevant values was observed.

**Keywords:** Electric Vehicles, Li- Ion Battery, BMS, SOC, Kalman Filter

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# Investigation of Thermal Performance of an Automotive Refrigerant System Internal Heat Exchanger (IHX) with Different Cross Sections Using R290 and R1234yf Refrigerants by 1-Dimensional Analysis Method

*Kağan Bayraktar*[1]
*Zeliha Kamış Kocabıçak*[2]

## Abstract

The harmful effects of materials containing PFAS on human health and the environment are becoming increasingly recognized. According to the updated EU Regulation 1907/2006 by the European Parliament and Council, materials containing PFAS chemicals will soon be banned in the automotive sector. Therefore, safer, and more environmentally friendly alternatives should replace PFAS-containing substances used in automotive air conditioning systems, such as R134a and R1234yf. R290 (Propane) emerges as a PFAS-free and environmentally friendly option that could serve as an alternative to the widely used R1234yf coolant in the passenger vehicle category. In the study, a 1-D model of the internal heat exchanger (IHX) component, which enhances cooling performance in automotive air conditioning systems, was created using the Amesim simulation program. On the IHX component with a length of 600mm and 6 bends, two commonly used cross-sections (10-tooth and 15-tooth) were selected. Heat transfer from the high-pressure liquid line to the low-pressure gas line was analyzed in watts using three different mass flow rates (Low, Medium, and High) and combinations of two different refrigerants (R1234yf and R290). According to the results obtained, it was determined that the IHX component with R290 usage provided an average of 93% more heat transfer than R1234yf for each flow rate and cross-section. Additionally, it was observed that the IHX component with a 15-tooth cross-section provided 3% more heat transfer than the 10-tooth cross-section when used with both refrigerants. These findings indicate that R290 refrigerant and a 15-tooth cross-section have the potential to be more efficient alternatives.

**Keywords:** R290, R1234yf, Heat Transfer, IHX, 1-D Simulation

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# Experimental Study on Effect of Compact Cross Flow Fan's Casing Parameters on Aerodynamic Performance for Split Air Conditioner using Particle Image Velocimetry

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*Dilek KUMLUTAŞ*[2]
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*Erdem SARICA*[5]
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## Abstract

The demand for compact products in air conditioners increases, considering the production costs and aesthetic appearance with the development of the HVAC industry. In Split Air Conditioners (SAC), the indoor unit design comes to the forefront as it is used in the room and appears to the end user. Considering the comfort requirements expected from the SAC while designing this indoor unit, Cross Flow Fan (CFF) is one of the frequently researched equipment due to its compactness. CFF is also a major component for flow characterisation in indoor units since air using eccentric vortex is driven by CFF. In this study, the aerodynamic performance of the compact product designed by reducing the CFF diameter by 7% was tested parametrically using the Particle Image Velocimetry (PIV) method. The Tongue angle, the vortex wall distance and the vortex wall angle were chosen as design parameters affecting the flow of the CFF. Experiments on the prototype SAC were carried out at three different values for each parameter. As a result, the effect of all parameters on the flow was presented to obtain the optimum structure in the prototype. It is foreseen that this study will be useful to researchers who will study in detail or various studies of compact SAC design.

**Keywords:** Split air conditioner, cross flow fan, particle image velocimetry, parametric study

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# Hybrid Scooter Modeling to Reduce Carbon Footprint in Last-mile Delivery

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*Alp Tekin ERGENÇ*[2]

## Abstract

Changes in consumer habits in recent years have led to a growth trend in the e-commerce and food delivery sectors. In particular, the COVID-19 pandemic increased the amount of time people spent at home due to factors such as stay-at-home orders, work-from-home arrangements, and online education for students. This situation has also been reflected in the number and size of companies established to serve consumers. Online shopping and food orders are increasing day by day compared to in-person shopping and cooking at home.E-commerce companies generally prefer cube vans and motorcycles for urban area cargo distribution, while motorcycles are usually used for food delivery due to their speed and parking advantages. The main reasons for motorcycle usage can be considered as the time pressure of consumers on online food orders and the parking problem in crowded cities.As a result of this, it has been observed that the negative environmental impacts of motorcycle couriers, whose numbers are increasing rapidly, are also increasing. To ensure a sustainable future, various actions are necessary for last-mile deliveries. Hybrid scooters are one of the strong alternatives to reduce the carbon footprint associated with package delivery, thanks to the fuel savings and lower emissions they provide. Hybrid approach not only reduces the emissions but also overcomes the range anxiety due to the all-electric range limitations of battery technology, thanks to its internal combustion engine. This study is a vehicle modeling study to calculate the carbon footprint that will be reduced by converting internal combustion engine scooters to hybrid (HEV) scooters in last-mile delivery.

**Keywords:** Sustainability, carbon footprint, last-mile delivery, hybrid scooter, e-commerce

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# Integration Blade Element Momentum Theory into the Computational Fluid Dynamics Solver

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*Nureddin DİNLER* [3]

## Abstract

A lot of high accuracy aerodynamic models in computational fluid dynamics (CFD) continues to drive significant developments in the simulation of complex fluid flows. This study explores the integration of Blade Element Momentum (BEM) theory into a CFD solver, aiming to bridge the gap between high-fidelity fluid mechanics and practical, basic engineering applications. The BEM theory, traditionally implemented for its robust performance in predicting the local forces on rotating blades, is combined with CFD for gaining ability to model intricate flow phenomena including three-dimensional effects and wake dynamics.

In this work, BEM parameters calculated due to CFD parameters. This allows to predict more accurate result which includes 3D effects such as wakes and tip vorticities. These initial conditions used as feedback for the CFD simulations, which in turn refine the blade load predictions by capturing detailed flow patterns and dynamic interactions that are typically cannot be captured by BEM alone.

Validation of the integrated model is made on NASA's Rotor Body Interaction (ROBIN) experiments. ROBIN case is a simple generic helicopter geometry. With this wind tunnel experiments rotor thrust and pressure distribution over body can be examined in different flight conditions. Integrated BEM model validated on that ROBIN case.

This integration approach reduces the computational cost by reducing complexity of the rotor geometry and mesh density. In the same time, this method still provides a high degree of accuracy, making it a promising tool for both academic research and practical engineering applications in rotorcraft and wind energy systems. Future work will focus on extending this model to model more complex blade geometries and operational conditions with better accuracy.

**Keywords:** Blade Element Momentum Theory, Computational Fluid Dynamics, Aerodynamic Simulation, Rotorcraft, Hybrid Modeling

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# Simulation and Optimization of the Active Suspension System of a 6x6 Vehicle

*Berk AYDOĞAN* [1]
*Ahmet YILDIZ* [2]

## Abstract

Vehicle suspension systems are one of the factors determining the load-bearing capacity and performance of a vehicle. The loads between the vehicle body and the road significantly affect passenger health and vehicle comfort, as well as vehicle usability, road holding capability and safety factors. Some research indicates that accident rates are related to the quality of suspension systems. This study focuses on the non-linear active suspension system of a 6x6 in-wheel engine electric vehicle, as well as passive suspension, active suspension, and multi-objective optimization. The free body model of the system has been developed and its equations have been formulated. Mathematical modeling and simulations of the wheel, vehicle body, seat, and tire-mounted electric motors have been carried out. The simulation includes passive suspension, active suspension, and is performed by comparing the results for three different scenarios with multi-optimization outcomes. The design variables of the optimization problem are selected as the stiffness and damping coefficients of the suspension for the wheel, the variables of the active suspension controllers, the stiffness and damping coefficients of the suspension for the seat, and the stiffness and damping coefficients of the wheel-mounted motors' suspension. The optimization results achieved with active suspension have shown better improvement compared to simulations performed with passive suspension.

**Keywords:** Electric vehicle, in-wheel motor, Simulation, genetic algorithm optimization

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# Design and Verification of a Viscous Damping Air Spring for Heavy Duty Vehicles

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## Abstract

In the suspension systems of heavy vehicles, air springs are the elements that serve to spring and carry the load, and shock absorbers are the elements that serve to dampen the vibrations caused by the road profile. Over time, shock absorbers encounter problems such as loss of oil properties and oil leakage and lose their critical functions. Therefore, they need maintenance or replacement. The aim of this study is to give air springs the same features as shock absorbers and to remove shock absorbers from the suspension system. In order to give the air springs the high damping properties of shock absorbers, two separate chambers were created inside the air spring structure, namely the bellows chamber and the piston chamber. As a result of the compression and extension movements that occur under dynamic operating conditions of the air springs, the air flow is restricted as it moves from the one chamber to other, and as a result of this restriction, damping force occurs. When a porous structure is used as a flow limiting element, the air encounters resistance while passing through the created compartments. The main factors that create the resistance encountered by air are directly related to the particle size in the porous structure used and the porosity rate formed in the structure depending on these dimensions. In this study, an air spring structure was modeled to create the optimum damping profile with air springs. The modeled air spring structure was produced and flow limiting elements with different porosity ratios were placed in the air spring. Appropriate test procedures have been determined to see the damping forces created by different porous elements. Finally, the test results were compared and the most suitable porous structure was selected.

**Keywords:** Air spring, Flow restrictor, Porosity ratio, Suspension system, Vibration, Viscous damping

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# Failure Mechanism Investigation of an Electronic Component with Steinberg Approach and Fatigue Accumulation Perspective

*Murat IŞIK*[1]

## Abstract

This study explores the vibration characteristics of electronic assemblies comprising a printed circuit board and electronic components which is decoupled from integration area. Employing vibration tests, a comprehensive vibration analysis of a real electronic assembly is conducted. Comparative assessments are made to determine the most effective, dependable and appropriate methodology for different scenarios in order to have more insight on the failure mechanism to provide a proper solution and ensuring the electronic system reliability and longevity is crucial, with automotive industry standards often demanding a usage life of at least 300.000 km.

In modern HVAC (Heating, Ventilation and Air Conditioning) systems, the control unit itself (PCB) is integrated into BLDC (Brushless Direct Current) unit and PCB plays a pivotal role in control, guidance and communication. PCB, comprised of diverse materials and interfaces, is exposed to varied environmental conditions transportation and operation due to customer usage profile with road vibration load. Consequently, they tends to various failure modes including mechanical, thermal and electrical.

This study provides a review of research on the vibration of electronic assemblies, encompassing studies on PCB vibration and lead wire fatigue. Vibration tests on the electronic components featuring sinusoidal sweep tests will be performed and comparisons of natural frequency results will be made. The main failure mechanism will be investigated with Steinberg approach and low cycle fatigue accumulation perspective to have a bird's-eye view for a quick solution.

**Keywords**: Steinberg, PCB, fatigue, HVAC, BLDC

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# Transportation Quality Issue Root Cause Analysis and Problem Solving with NVH Approach

*Murat IŞIK*[1]

## Abstract

Transportation-induced road load vibrations and storage conditions pose a significant challenge to the structural integrity of carton packages, particularly impacting the BLDC (Brushless Direct Current) motor assembly. Weaknesses in packaging materials result in deformations that directly impact the unbalance of the BLDC motor wheel, leading to increased vibration levels during operation.

To address this quality issue, linked to package deformation, an NVH (Noise, Vibration, and Harshness) methodology approach is employed. This involves precise measurement and correlation of BLDC motor vibrations with unbalance values. Analysis reveals that packaging deformations create position deviation in tilt direction of wheel, exacerbating blower unbalance and subsequent vibration levels. Notably, these vibrations are further transmitted through the decoupling system, predominantly composed of rubber materials.

During transportation of packages, having weakened structural integrity due to storage circumstances, containing BLDC motors, road load vibrations induce structural deformations, exacerbating the issue. Consequently, transmitted vibrations during HVAC blocked force bench tests surpass established customer reference values relying on hundreds of individual's subjective evaluation, prompting the implementation of countermeasures on increasing the robustness of the package. This technical investigation highlights the complicated relationship between packaging integrity, motor balance, and vibration dynamics within HVAC systems. Effective mitigation strategies are crucial to enhance system robustness and ensure compliance with highly demanding standards in automotive for transportation robustness requirements.

**Keywords:** Transportation, vibration, unbalance, BLDC, packaging

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# Vibro-Acoustic Analysis of a Stamped Thin-Walled Component for a BLDC Air-Borne Noise Reduction

*Murat IŞIK*[1]

## Abstract

In automotive engineering, BLDC (Brushless Direct Current) motors play a pivotal role for HVAC (Heating, Ventilation and Air Conditioning) systems for air conditioning inside vehicles. However, reduction of the noise generated by BLDCs remains a significant challenge. This study focuses on the vibro-acoustic behavior of stamped thin-walled PCB (Printed Circuit Board) covers utilized in BLDC. While these covers are primarily employed for electromagnetic compatibility (EMC) protection coming from PCB having a role in control, guidance and communication, their resonance characteristics can consequently amplify noise emitted by BLDCs.

Through comprehensive analysis and optimization, this research aims to reduce noise amplification by optimizing the design of the PCB cover. The study investigates the resonance frequencies of the cover and their correlation with critical noise frequencies emitted by BLDCs. By employing optimization techniques, including topology analysis and resonance frequency shifting, the research seeks to attenuate noise amplification effectively.

Results demonstrate that resonance frequency manipulation can significantly reduce noise levels, potentially achieving reductions of up to 7 dB(A) within relevant RPM ranges. This study emphasizes the importance of structural design optimization in achieving quieter BLDC systems in automotive applications, contributing to improvements in noise reduction strategies. By addressing noise concerns associated with BLDC operation, this research contributes to enhancing the overall driving experience, particularly in terms of comfort and acoustic performance.

**Keywords:** NVH, air-borne noise, design optimization, topology, amplification

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# Kinematic Analysis on Lifting Tailgates in Automobiles and Light Commercial Vehicles

*Mehmet GÜVEN*[1]

## Abstract

In this article, information will be given about the kinematic calculation of gas pistons in overhead type tailgates used in automobiles and light commercial vehicles, which parameters are included in the calculation and what is taken into consideration in this kinematic calculation, and the evaluation to be made.

Some of the factors affecting the kinematic calculation are; The door architecture to be used, the weight of the tailgate, the coordinates of the center of gravity, the maximum opening angle of the tailgate, the coordinate of the body connection point of the gas pistons, the coordinate of the door connection, the distance between these two points, both when the overhead type tailgate is closed and when it is closed. Whether the amount of stroke required in the fully open position is suitable for the closed position, moment balance, both the ambient temperature and the temperature of the gas, which are the parameters of the Ideal Gas Law, the type of gas in the gas piston, gas constant and gas pressure, The coordinates of the rotation axis of the hinges where the body connection of the upward-opening tailgate takes place and which provides the rotation movement, -if any- the coordinates of the outer opening handle, -if any- the coordinates of the inner closing handle, the coordinates of the bottom middle point of the upward-opening type tailgate, the upward pressure of the gas pistons, the type of connection that will open correctly or the type of connection that will flip over, the compression ratios applied by the open and closed positions of the gas piston, the small diameter shaft of the gas piston, while making opening-closing movements in the gas cylinder, and the body and the door, friction during rotation in its connections, etc. The decision is made according to the parameters.

**Keywords:** Liftgate, Tailgate, Kinematics, Gas Sturts

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# Numerical Analysis Of The Effect Of Collector Height And Radius On System Performance In Solar Chimney Power Plants

*Fuat TAN*[1]
*Merve Sinem AMUCA*[2]

## Abstract

The computer-aided design and performance optimization of centrifugal pumps, which are extensively utilized in the industrial sector, significantly reduce costs. Considering the limited number of design parameters tested through experimental methods, this disadvantage has been mitigated by selecting a wide range of parameters. Through experimental design methods, geometric and operational parameters selected during the design phase are systematically executed to obtain a mathematical equation for performance and comparative result graphs. The selected design and operating parameters were defined in the experimental design table, and finite element computational fluid dynamics analyses were conducted using the analysis inputs provided by the method. In this study, the design of a sample centrifugal pump was conducted in a computer environment, and the effects of impeller curvature radius and inlet velocity on internal pump velocity and pressure distribution were analyzed using commercial CFD software. As the selection of turbulence models within the analysis program affects the results, the most commonly used k-epsilon and k-w turbulence models were compared in centrifugal pump analyses. By modeling pump internal velocity and flow behavior using the central composite experimental design method, the relationship between result parameters in 3D space was established, and performance behavior was examined. The obtained result visuals, comparative graphs, and response functions indicate that the selected impeller curvature radius and turbulence model are critical parameters influencing pump efficiency.

**Keywords:** Centrifugal Pump, CFD, Performance, Turbulence model

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# Numerical Investigation of a Slider Canopy Locking Mechanism

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*Sadettin ORHAN*[2]

## Abstract

Slider mechanisms, providing an alternative to conventional tilt-up mechanism interfaces in aerospace applications, are highly preferred in aviation structures because of their lightweight design, extended maintenance intervals, and improved fatigue life.
On the other hand, geometric tolerances between components are crucial for the proper assembly of the sliding mechanism. Particularly, precise placement of bearings and slides ensures smooth operation of the mechanism.
Impact forces are a known source of concern, as they not only increase vibration amplitude but also reduce system reliability, stability, life, and precision.
In this study, three different mechanism models of a closed and fully locked sliding canopy mechanism under the static loads were designed, and the displacements and stresses corresponding to eccentricity were investigated by the finite element method.
The first model studied was equipped with a fixed pin structure. However, applying the fixed model to such a sliding system requires narrow tolerances, and these narrow tolerances are only available with a special tool design for assembly process. Deviations in tolerances during mechanism operation may require an extra trimming process for the pin diameter. However, the reduction in pin diameter leads to a loss of rigidity and a decrease in the load-bearing capacity. This leads to critical fatigue life and inability to fully absorb loads in the opposite direction on the structure.
As the second model, an eccentric pin composed of a single web was considered due to its simpler and more feasible application, design, and manufacturing compared to other solutions.
In the third model, a design with a double web whose front web was designed in accordance with the eccentric pin was discussed. With this design, it was thought that the double web solution would be effective against the moments applied to the pin body.
**Keywords:** Mechanisms, Sliding Mechanisms, Canopy, Eccentricity, Eccentric Pins

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# Production and Characterization of 7xxx Series Composite Material by Powder Metallurgy Method

*Figen KÖKLÜ*[1]
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## Abstract

Aluminum and aluminum alloys are materials that have a lot of industrial use. Aluminum can be alloyed into a material that is three times lighter than iron and has a strength close to iron. In this way, its use is increasing especially in the automotive, railway, maritime and aviation industries. Powder metallurgy (TM) method has been used in the production of Al alloys, especially for the last 20 years. The high production costs and maintenance difficulties of al matrix composites are the biggest problems of this material. It is obvious that the production cost can be reduced by using powder metallurgy.

In this study, SiC ceramic powders and Gnp, which have good composite forming properties, were mixed homogeneously for different times and in different ratios with a high-energy ball milling device for the alloying of Al, Zn, Cu, Si metal powders. Samples with varying zinc amounts of 2%, 4% and 6% by mass were mixed for 45 minutes, 90 minutes and 135 minutes to obtain 9 different samples. A spex type Retsch MM 400 model mixing device was used in the grinding process. X-ray diffraction (XRD) analysis was performed to examine the mixtures with different zinc ratios obtained after this process.

The powder mixtures obtained by the MA method were sintered in a hot isostatic press at 600 oC in the argon atmosphere, a protective gas, for 45 minutes and turned into billets. The prepared billets were polished and scanning electron microscope (SEM) images were taken. In addition, Vickers microhardness measurements of these billets were made, and the crystal size values obtained using the data obtained from XRD graphs and the Scherrer equation were also examined.

**Keywords:** Powder metallurgy, Mechanical alloying, Metal matrix composite, Microstructure, Sintering

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# A Case Study on the Performances of the Pressure Gauges used in the Industry

*Can EKİCİ*[1]

## Abstract

Between 2015 and 2020, 772 manometers used in the industry were calibrated and the performances of the devices operating under continuous pressure and their deviations from their declared classes were evaluated. In the study, manometers used in many different industries were examined. Among these manometers, there are manometers used in many fields such as chemical industry, technical service, vehicle maintenance, electronics industry, test laboratories, biomedical, fire tube production, automobile industry. Analogue manometers are widely used in industry, so their performance can be important for users in decision-making processes. As a result of the studies carried out, suggestions for use were presented and comments were made for the industry.

**Keywords:** manometers; calibration; metrology; pressure gauges; pressure metrology

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# Reduction of Magnetic Force Excitation in Bldc Motors For Improved Acoustic Performance in Hvac Systems: Addressing Magnetic Distortion

*Ahmet Arif KOSE*[1]
*Murat IŞIK*[2]

**Abstract**

**Keywords:**

[1] Test & Validasyon Mühendisi, VALEO Otomotiv, Türkiye
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# Resolving Low-Frequency Noise and Vibration Issues in BLDC Blowers: Analysis and Improvement Study in HVAC Systems

*Ahmet Arif KOSE*[1],
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## Abstract

This research addresses the issues of low-frequency noise and vibration in Brushless Direct Current (BLDC) blowers used in HVAC (Heating, Ventilating, and Air Conditioning) systems, which are critical concerns due to their potential impact on system performance and durability. This study has become necessary due to customer complaints regarding operational disturbances. To comprehensively address these issues, advanced analytical techniques such as Contour Plot Displacement Analysis, Fast Fourier Transform (FFT) analysis, and Order Analysis have been employed. These methods have enabled detailed examination of operational trend patterns and vibration profiles at critical points like Decoupling, where BLDC blowers are located. The analysis determined the system's first modal frequency to be 33.667 Hz and identified the decoupling resonance frequency of the BLDC fan to be above 42 Hz. This mismatch leads to bending movements in the BLDC fan, causing unwanted pumping actions within the HVAC system. Initial assessments recorded a noise level of 28.08 decibels at 62.5 Hz. After implementing a locking mechanism to stabilize the decoupling system, the noise level significantly decreased to 16.3 decibels, resulting in a 12-decibel improvement. These tests are crucial not only for diagnosing problems but also for validating the effectiveness of potential solutions to ensure the system's reliability and operational lifespan. If these issues are not addressed, they can severely impact customer satisfaction and system efficiency. This study forms a foundation for efforts to enhance the design and functionality of HVAC systems by minimizing mechanical instabilities and optimizing acoustic performance.

**Keywords**: HVAC, Vibration, Noise, ODS, Resonance

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# Technical and Economic Review of the Use of Heat Pumps in Greenhouse Air Conditioning Systems

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*Mustafa Zeki YILMAZOĞLU*[2]

## Abstract

Electricity consumption in greenhouses in Turkey is increasing due to the unconscious use of electricity consuming tools. In addition, the cooling of greenhouses in the summer months increases electricity consumption even more, while the heating of greenhouses in the winter months increases both heat production and electricity consumption.

The main objective of this study is to evaluate the technical and economic impacts of heat pumps in greenhouse air conditioning systems. In this context, heat loss and gain calculations will be made according to the greenhouse types that can be established in different climatic conditions on the basis of the covering materials used in greenhouse cultivation, greenhouse types, temperature and humidity requirements of the products grown in greenhouses, and the thermal loads required for heating and cooling of greenhouses will be determined based on the ANSI ASAE EP 406.4 standard. Meeting these loads with the applicability of air source and ground source heat pumps in greenhouse systems, energy efficiency and cost effectiveness will be examined, and a photovoltaic system will be created to meet the electrical energy required by the heat pumps. Within the scope of this study, heat loss/gain calculations of a greenhouse will be made with a psychometric diagram according to the average temperature values of the provinces in Turkey. The technical and economic feasibility study of the use of heat pumps in greenhouse cultivation in the regions where greenhouse cultivation is intensive and in Ankara province will be carried out. The findings will contribute to the identification of strategies that support energy saving and achieving sustainability goals in the agricultural sector.

**Keywords:** Energy, Heat Pump, Greenhouse. Photovoltaic, Sustainability

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# Experimental Investigation of Heat Pipe Performance in Different Inclination Angle for a Professional Radio Device Requiring Electronic Cooling

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## Abstract

Heat pipes are highly effective for thermal management, efficiently transferring heat to prevent electronic device overheating, thereby enhancing performance and lifespan. Their flexible mounting options allow them to be positioned according to a device's internal structure. In modern electronics, heat pipes are crucial for thermal management.

An experiment was conducted to evaluate the performance of a sintered copper heat pipe in different orientations for cooling a professional radio device. The heat pipe, 25 cm long with a 10 mm diameter, contained water. Three thermocouples were placed at 0 cm, 20 cm, and 25 cm along the pipe to measure temperature. A resistance heating system was integrated between aluminum plates, with thermal paste used for efficient heat transfer.

The experiment aimed to create temperature profiles on the heat pipe at various slope angles: 0° (flat), 15°, 30°, 45°, 60°, and 90°. The data obtained were used to evaluate heat transfer effectiveness on inclined surfaces and optimize system performance. Results showed a decrease in heat transfer rate with increasing angle, providing insights for improving thermal systems in industrial applications.

In conclusion, when using heat pipes in professional radio devices, placement angle, cost, and performance must be considered. This experiment offers valuable guidance for enhancing thermal efficiency in engineering and industrial processes.

**Keywords:** heat pipe, electronic cooling, thermal management, heat transfer

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# Investigation Of Damages To Transportation Systems During 6 February Earthquake

*Nuriye KABAKUŞ*[1]
*Nathan Wankunda MWASEMBE* 2

## Abstract

For disaster-resistant societies, it is critical to ensure uninterrupted post-disaster transportation in emergency response and rescue areas. Transportation of emergency personnel and materials to affected areas and ensuring the mobility of people for different purposes are achieved through efficient and reliable transportation systems. Adequate planning and coordination of transportation resources is crucial to ensure timely assistance, delivery of relief supplies, and evacuation if necessary. Thus, secondary disasters that may occur after the earthquake can be prevented by carrying out the necessary infrastructure works. In this study, the performance of transportation systems in the earthquakes that occurred on February 6, 2023 in Pazarcık (Mw7.7) and Elbistan (Mw7.6) districts of Kahramanmaraş and affected 11 provinces were investigated. Within the scope of the study, the extent of damage to transportation systems after the earthquake was explained. As a result, it was determined that railway transportation systems suffered the greatest damage with a total of 17.4 billion TL. In addition, this study offers solution suggestions such as improving road and bridge designs to withstand seismic forces in order to avoid any disruptions and delays in transportation, implementing traffic management strategies to reduce traffic congestion, and creating alternative transportation routes that will provide connection in emergency situations during trip after the earthquake.

**Keywords:** Earthquake, transportation systems, damage, seismic forces

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# Investigation of Soil-Pile Structure Interaction In Lıquefiable Soils

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## Abstract

Turkey frequently encounters major earthquakes due to active fault lines in its geography, resulting in loss of life and property damage. Therefore, considering the effects of seismic forces in structural design is crucial. Analyses of structure-soil interaction, particularly for rigid, large-scale structures such as multi-story buildings where seismic behavior is significant, became mandatory for multi-story pile supported structures under specific seismic design categories and local soil conditions with the enactment of the "Türkiye Bina Deprem Yönetmeliği" in 2019. In this study, the interaction between pile foundation systems and soil for reinforced concrete structures has been investigated. Analyses were conducted on liquefiable and non-liquefiable soils, observing the effect of liquefaction on structure-pile-soil interaction. Soil models were created using data obtained from drilling, field and laboratory experiments for a project in Gemlik. Suitable earthquake records were selected based on the soil class and seismic level of the Gemlik region of Bursa, and spectral matching was achieved using Seismomatch software. Subsequently, output related to the production of excess pore water pressure models in the nonlinear time domain was obtained using nonlinear site response analysis program named Deepsoil, and these outputs were used in structure-pile-soil interaction analyses. In these analyses, the effect of liquefiable soil, the influence of saturated loose sand on pile internal forces and the variation in pile internal forces due to low water levels were clearly demonstrated.

**Keywords:**TBDY-2018, site response analysis, liquefaction, excess pore water pressure ratio, structure-pile-soil interaction,

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# Effects Of Multıple Velocıty Pulses On Earthquake Response Of A Sımple Structural System

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## Abstract

Near fault ground motions with velocty pulses have an increased damaging potential on the structures. Recently, it was discovered that number of velocity pulses in the near fault ground motions may be more than one. Accordingly, this study is focused on the earthquake reponse of a simple structural system subjected to ground motions with multiple velocity pulses. In scope of the study, a nonlinear 5 story stick model is used to simulate a 5 story reinforced concrete story structural system. This system is subjected to a number of ground motions obtained with predefined mathematical functions. The mathemetical functions are intended to simulate the ground motions with single and multiple velocity pulses. These simple functions are scaled to a level which leads to a nonlinear behavior of the structural system. The pulse periods of velocity pulses are used as a parameter together with the number of pulses. In the study varying pulse periods and pulse numbers are used for parametric nonlinear time history analyses. The analyses results are presented in terms of maximum interstory drifts. From the study it was observed that the interstory drift values of the all stories of the 5 story structure varies together with the variation of the number of velocity pulses. Another observation from the study is that the period of the velocity pulse is another important parameter that affects the structural resonse.

**Keywords:**Earthquke, Velocity Pulse, Ground Motion

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# Investigation of The Behavior of Fixed Offshore Structure Under Earthquake Loads

*Melis AKFIRAT*[1]
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Abstract
Offshore structures are very important in terms of producing natural gas and oil. Offshore structures are often designed as a steel space truss. Unlike truss-type structures built on land, offshore structures are subject to hydrodynamic loads. Offshore structures can be built in fixed and moving. In recent years, offshore structures with different features which is increasingly used all over the world can be subjected to external loads such as wave load, earthquake load, wind load. One of the most important points to be considered for the long-term use and protection of these structures is external loads. Earthquakes such as 17 Agustos 1999 Kocaeli, 23 Ekim 2011 Van, 30 Ekim 2020 İzmir, 6 Subat 2023 Kahramanmaras earthquakes caused quite a lot of damage, loss of life and property. For this reason, it is of great importance to determine the behaviors that the structures can show in the earthquake effect. For this purpose, an offshore structure of the jacket type was designed and modeled as three dimension by using ANSYS finite element program. The behavior of the structure under the effect of different earthquakes were determined by performing dynamic analyzes. As a result of the analyzes carried out, the values of displacement and stress obtained were examined.
**Keywords**: Offshore Structures, Dynamic Analysis, Earthquake Load, Jacket Type Platform, Finite Element Method

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# Analysis of Süheyl Bey Mosque Restoration

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*Şahin Burak GÖKÇE 3*

## Abstract

Süheyl Bey Mosque, built by Mimar Sinan in the mid-16th century, is situated in the Beyoğlu district of Istanbul. From an architectural and engineering standpoint, it features an original design with the main prayer area organized around a rectangular courtyard, resulting in a symmetrical structure. Its graceful dome structure enhances the interior with a bright and airy atmosphere. The meticulous attention to detail is evident in the decorations on the facades, as well as in the interior elements such as the pulpit and the mihrab.

In 2010, the Directorate of Foundations Istanbul Regional Office applied for restoration of the mosque's minaret, which contained some wall remnants. This application to the Istanbul 2nd Conservation Council led to decision no. 3772 on September 15, 2010, approving the survey and restitution project for Süheyl Bey Mosque remnants. The decision designated the conservation group as 1, deemed the proposed restoration project unsuitable, recommended conserving the existing remnants, rebuilding the minaret in its original location, and suggested bringing proposals for modern mosque applications for the existing area without interfering with the remnants. It was noted in the decision that the conservation of the existing remnants had been completed.

Various methods were employed in the conservation of the existing remnants, including cleaning to remove harmful substances such as dust, dirt, lichen, and moss, but protective coatings were not applied to the remnants. The original Süheyl Bey Mosque was constructed in the Ottoman period as an octagonal mosque with a dome and a single minaret. However, the currently constructed mosque deviates from this octagonal form and instead features a rectangular layout without a dome, and one of its facades should be clad in glass. Additionally, elements such as the dome ring, drum, and intricately decorated crown door are currently absent

**Keywords:** Restoration, Conservation, Süheyl Bey Mosque, Restoration Construction,Mimar Sinan

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# Stress Analysis of Uniform and Trapezoidally Loaded Deep Beams with Fixed Supports at Both Ends Using the "Displacement Potential" Approach

*Muhammet DOĞAN*[1]
*İrfan COŞKUN*[2]

## Abstract

In this study, the stress problem of deep beams, supported at both ends and loaded separately with uniform and trapezoidal distributed load, is discussed with the finite difference method using the displacement potential function Ψ(x,y). It is assumed that the material used in the problem is an isotropic Hooke body and there are no volume forces.

The problem was considered as a plane stress problem, and the governing differential equations and the governing biharmonic differential equation were reduced to a set of equivalent linear equations of order O ($h^2$, $k^2$) that depend only on the displacement potential considering the boundary conditions.

In the study, to test the accuracy of the displacement potential approach, the same problems were solved using the finite element method with the ANSYS software package program and the results were discussed.

As a result of the study, it was determined that the values found in the analysis of deep beams using the displacement potential approach via the finite difference method were close to the values found in the finite element method. Also, it was observed that the displacement potential approach could be used in the solution of plane stress problems with mixed boundary conditions.

**Keywords:** Deep beam, Plane stress, Displacement potential, Finite difference method, Set of linear equations, Mixed boundary conditions

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# The Evaluation of the Dynamic Behaviour of Improved Clayey Soils by Jet Grouting

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*Murat Ergenokon SELÇUK*[2]

## Abstract

Recently in civil engineering applications, jet grouting as a soil improvement method is widely preferred due to its applicability on different soil types. Jet grout columns (high modulus columns), constructed through exceedingly high jetting pressures, displace the surrounding soil, thereby providing compaction in soil particles. By this study, a case study from Bursa province, Gemlik county, Turkey was considered and the field experiments before and after soil improvement were held, the result numerically evaluated. In order to eliminate the bearing capacity and settlement problems at the site, soil improvement was carried out by jet grouting. After improvement of the site, core sampling, pile integrity and axial loading tests were carried out to test the performance of the jet grouted columns. In addition to them, to put forth the modification of soil properties in compression zone after jet grouting in clayey soils seismic cross-hole test and multi-channel analysis of surface waves (MASW) performed at the construction site along constructed jet-grout column rows. The seismic test results point out significant enhancement of the seismic wave (shear wave and pressure wave) velocities in improved soil layers compared to initial values. To conclude, the behavior of the site under dynamic loads was evaluated numerically by using DeepSoil software. Upon reviewing the findings, it became evident that there was a marked enhancement in the overall site dynamics and a notable decrease in load-induced deformations.

**Keywords:**Jet grouting, Shear wave velocity, DeepSoil, Seismic cross-hole test, Clayey Soil

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# Resistance of Cement-Based Composites with Different Contents to High Temperature and Behavior After High Temperature

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*Umur Korkut SEVİM* [2]
*İmren DOĞRU* [3]

## Abstract

There are internal and external factors that affect the principle of permanence in structures and shorten the life of the structure. These are classified in themselves as physical-mechanical factors and chemical-biological factors. High temperature is one of the physical-mechanical Decients. In concrete subjected to high temperature, compressive strength loss, cracking and concrete spills are observed. The exposure of concrete to high temperature and the types of cooling of high temperature significantly affect the performance of the structure. In this context, while studying the effects of high temperature, it is also becoming an important subject of study to compare the behavior of concretes of different contents under the influence of high temperature. In the study, it was aimed to conduct studies on the behavior of silica fume, fly ash materials commonly used in concrete technology to concrete, which are mixed at high temperature and after high temperature. In this study, the behavior of mortars containing control, fly ash and silica fume in the face of high temperature was investigated. For this purpose, mortars have been produced in 3 different groups as control, fly ash and silica fume. Fly ash and silica smoke were added at a rate of 15% of the weight of the cement. In its entirety, cube samples were used and concrete test hammer experiments were carried out. It was exposed to the temperature in a high temperature oven for 2 hours at 600°C. The samples taken from the oven were cooled using a cooling system (spraying method / self-cooling) in 2 different ways and broken in a press machine to determine their compressive strength. 56 Of mixtures containing fly ash and silica fume. it has been determined that it reaches a higher compressive strength value at 600°C per day compared to the control mixture.

**Keywords:** *Cement-Based Composites, High Temperature, Resistance, Fly Ash, Silica Fume*

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# Investigation of Mechanical Properties and Life Cycle Assessment of Alkali Activated Interlocking Parquet and Curbs Produced in Industrial Plants

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*Ezgi ÖRKLEMEZ*[2]
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*Uğur DURAK*[4]
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## Abstract

Approximately 8% of the $CO_2$ emitted into the atmosphere comes from cement production alone. For this reason, researchers around the world investigate alternative binders to reduce $CO_2$ from cement production. In addition, according to European Green Deal, which is closely related to our country, precautions should be taken in cement production and consumption stages starting from 2023. Therefore, in this study, it has been investigated whether the parquet and curbs used in municipalities in Kayseri can be produced in a more environmentally friendly way without cement. For this purpose, blast furnace slag as binder, powdered sodium metasilicate as activator and river sand as aggregate were used. Cement-free mixtures with zero workability were produced using industrial machines. The samples were cured in air and water for 7 and 28 days. According to the test results, the water absorption rate (max. 6%) and abrasion resistance (max. 18000 $mm^3/5000mm^2$) conditions specified in TS 2824 EN 1338 and TS 436 EN 1340 for parquet and curbs were met in cementless parquet and curbs. Similarly, the minimum 2.9 MPa and average 3.6 MPa criteria for tensile strength in splitting for parquet and the minimum 3.5 MPa flexural strength criteria for curbs were met for cementless parquet and curbs. An environmental impact study was also carried out in the study. Accordingly, while the Global Warming Potential (GWP) value for traditional cement parquet was 3.35E+02 kg $CO_2$ eq, it was calculated as 1.60E+02 kg $CO_2$ eq with a 52% decrease for alkaline activated parquet. For cement based curbs, the GWP value was 3.40E+02 kg $CO_2$ eq, while for alkali-activated curbs it was calculated as 1.41E+02 kg $CO_2$ eq with a 58% decrease. The results showed that cement-free parquet and curbs both meet the limit conditions stipulated by the standards and are more environmentally friendly building materials.

**Keywords:** Alkali activated materials, parquet, curb, life cycle assessment.

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# Experimental And Numerical Study for Local Scour Around Cylindrical Bridge Pier in Non-Cohesive Sediment Bed

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*Mustafa GÜNAL* [2]

## Abstract

Local scour is a significant factor contributing to the bridge's collapse, which is defined by the erosive action of sediment-water flow in river systems. Thus, studying scouring is a crucial approach to assess the potential for bridge failure caused by scour. This study investigates the local scour phenomenon in non-cohesive bed conditions using both experimental in a laboratory flume and numerical approaches by applying the computational fluid dynamics (CFD) method with FLOW 3D software to model and compute local scour in the same type of bed. Experimental modeling in live bed flow conditions reveals that water depth is the primary factor influencing local scour depth, with high-velocity water exceeding critical velocity resulting in increased scour depth aligned with pier depth. Sediment accumulation occurs downstream from the scour hole, with scour development reaching equilibrium quickly. The developed numerical model, FLOW 3D, proves efficient in simulating scour depth and flow around bridge piers, with mesh quality significantly impacting modeling accuracy.

**Keywords:** pier scour; non-cohesive sediment; non-uniform sediment; FLOW 3D; local scour, CFD.

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# Assessing the Benefits and Challenges of Using Digital Twins in the Building Construction Industry

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## Abstract

Today, in the face of rapid digitalization, traditional methods have become both slow and economically expensive. That's why the importance of digitalization is increasing day by day. The study showed that digital twins offer significant advantages in the construction industry. First, it improves project management thanks to real-time data collection and analysis capabilities. In this way, it allows for a decrease in costs and a more effective use of time. In addition, thanks to simulations and tests in the virtual environment, risks and possible crises can be identified in advance and precautions can be taken. In this way, the decision-making mechanism during the construction process can be carried out more consciously. However, there are disadvantages as well as benefits in the use of Digital Twins (DT). First of all, there are costly infrastructure and software needs. In addition, being fully integrated into such a technology, which is one of the traditional application methods, and being used effectively by the personnel can be achieved over time. However, concerns about security and data protection are a significant disadvantage. The application and use of Digital Twins in the construction industry increases efficiency in projects, while also revealing new challenges and needs. As a result, in this article, which examines the use of Digital Twins in the construction industry, it is aimed to touch upon both their benefits and disadvantages and to evaluate the actions to be taken at the point of implementation in terms of efficiency, cost and time.

**Keywords:** Civil Engineering, Digital Twins (DT), Construction Management

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# Effectiveness of different filtering approaches for enhancing AE behavior of concrete

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*Ninel ALVER*[4]
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## Abstract

Earthquakes pose significant challenges that affect both society and economies. In order to ensure structural reliability and take necessary precautions, it becomes imperative to detect structural damage. For this, non-destructive testing (NDT) methods are useful to obtain information about invisible damage without damaging structural elements. Acoustic emission (AE) is one of the NDT methods and has an important place in the field of civil engineering. This method is based on elastic waves due to the sudden release of energy from damage to the material under loading, which are detected by sensors and converted into electrical signals and analyzed to provide damage information such as location, type, time of occurrence, magnitude and orientation.

However, the accuracy of this critical information depends on the cleanliness of the AE data, and noise-related signals may be mismatched within crack-related signals. Therefore, this study investigates different AE filtering approaches to improve and harmonize the damage behavior of concrete. As part of the experimental procedure, concrete cube specimens subjected to uniaxial compression were monitored by AE technique and the obtained data were correlated with mechanical findings. In order to improve the results of the parameter analysis, the effectiveness of different approaches is proved, depending on the minimum number of strokes that constitute an AE event.

**Keywords:** Damage monitoring, Acoustic Emission (AE), filtering, concrete, uniaxial compression.

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# Identification of Damage Scale in Concrete by Ib-Value Analysis of Acoustic Emission

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## Abstract

Damage assessment is a critical and complex issue for the safety of structures. Most of the techniques used for this purpose usually examine the existing damaged state of the structure and need sampling in the process. However, it is very important to determine the current condition and safety of the structure before the damage becomes visible. In this context, the Acoustic Emission (AE) method, one of the non-destructive methods, overcomes this problem and enables real-time monitoring of even micro damages. With the AE method, the time, location, type, orientation and scale of damage can be determined by detailed analysis of AE parameters. The advantages of the AE method include real-time monitoring and early detection of damage. This plays an important role especially in the long life and safe use of structures. With these features, the AE method stands out as an important tool in the monitoring and management of structural health.

This study investigates the effectiveness of the AE method in determining the damage scale in concrete structures. For this purpose, concrete specimens subjected to compressive testing under laboratory conditions were monitored by AE and the AE parameters obtained together with the improved b-value (Ib value) analysis, which is known as an effective method in seismology, were analyzed. The AE method detects the elastic waves generated during the propagation of microcracks in the material and these data are used for damage characterization. The results of the study enable the scaling of the intensity distribution of AE activities under stress, facilitating the monitoring and prediction of damage occurrence. This improves the safety of structures and makes it possible to detect possible major damages in advance and take necessary measures.

**Keywords:** Acoustic Emission (AE), Ib-value, damage scale, damage monitoring

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# Analysis of Floods Resulting from Dam Break with Two Dimensional (2D) Models: Case of Değirmendere Dam

*Said ÖLMEZ*[1]
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## Abstract

Humanity has always balanced living in harmony with nature and striving to improve its quality of life, while also contending with nature to sustain livelihoods. One example of this struggle is the construction and management of dams, which redirect, store, and utilize water for various purposes. Dams, with their massive water reservoirs, are also defined as risks and hazards. There are numerous studies on flood analysis through different software tools concerning dam breach analysis in the literature. This study focuses on the potential scenario of the Değirmendere Dam's collapse, situated in areas with residential areas, industrial and livestock facilities, agricultural lands, and major transportation routes. The scenario was processed in the HEC-RAS program using digital elevation model maps created with various technological tools and software. The Değirmendere Dam, located approximately 12 km northwest of the city center of Amasya in Turkey's Black Sea Region, was completed by DSİ (General Directorate of State Hydraulic Works) in 2012 for agricultural irrigation and drinking water supply purposes. The dam has a volume of 1,351 hm3 with a core of clayey rock-fill, a height of 49,60 m from the streambed, and a reservoir capacity of 6,43 hm3. The analysis of dam breach scenario is piping in using the HEC-RAS program, capable of modeling two-dimensional (2D) unsteady flows. Through simulations, flood inundation maps, maximum flow depths, maximum flow velocities during flooding, and other relevant data were obtained in the event of the Değirmendere Dam's breach. Based on this data, the potential impact of flooding on settlements, facilities, roads, and lands in the dam's downstream area was predicted. The aim is to assist relevant institutions and organizations in disaster and risk management by providing necessary information for potential preventive measures.

**Keywords:** Dam Break, Değirmendere Dam, Flood, Two-Dimensional Modelling, HEC-RAS

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# The Effect of Olive Seed and Ash on the Mechanical Strength of Cement-Based Composites

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*Duygu KIRKYAŞAROĞLU* [3],

## Abstract

Cement-based composites are one of the most widely used building materials and are one of the important issues that need to be improved both in terms of environmental factors, cost reduction and energy consumption. In line with the sustainability studies in the construction sector, the search for alternative materials to reduce the negative effects of cement and aggregate is continuing. However, while reducing cement and aggregate with alternative material and ensuring sustainability, its effect on mechanical strength is too important to ignore. Dec. The aim of this study is to investigate the effect of olive kernel and olive kernel ash on the mechanical strength of cement-based composites and to examine their usability in different fields. In the study, aggregate with olive kernel at 10%, 20%, 30% rates, cement with olive kernel ash at 1%, 3%, 5% rates were replaced by partial weight and mortar was produced. Mixtures, control mortar, olive core mortar, olive core ash mortar, both olive core and olive core ash mortar 9 different mixtures have been produced. Mixtures beam sample (4*4*16 mm) filled into molds and cured in two different ways, in air and in water. After curing the samples, 7, 28, and 90. during the days, they were subjected to pressure and bending tests and their mechanical strength was examined. As a result of the investigations, it has been observed that the workability of olive seed ash mixtures is better and, at the same time, the sample strength results give better results compared to the control mortar. It has been determined that the use of olive seeds instead of aggregate causes a decrease in pressure and bending strength. However, it has been observed that the mechanical strength of the mixtures is positively affected by the addition of olive kernel ash to mixtures containing olive seeds.

**Keywords:** *Sustainability, Olive Seed, Olive Seed Ash, Cement-Based Composite, Strength*

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# Value Engineering for Sustainable and Cost-Effective Construction Material Selection

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## Abstract

Enhancing efficiency in the construction sector involves optimizing quality, time, and cost. Despite these efforts, challenges often arise. Projects may experience delays, budgets can be exceeded, or the quality of products may not meet the required standards. Traditional cost control and planning methods can help manage the budget, but project owners frequently complain that the quality is inadequate compared to the low cost. Therefore, it is crucial to consider all possible alternatives at the design stage to achieve the best balance of cost, time, and quality. The selection of a material plays a key place in the life cycle of a product/project. The decision to select the correct material can decrease the manufacturing cost and time. Value Engineering is a robust methodology that addresses problems and/or reduces costs while maintaining or improving performance and quality requirements. It involves reviewing new or existing products during the design phase to lower costs and enhance functionality, thereby increasing the product's value. In this study, the goal was to select a product to be used as reinforcement while designing a concrete canoe using the Value Engineering Method. Initially, a value engineering team was formed, and the team identified the necessary qualifications for the product. Potential products meeting these qualifications were researched, and three alternative products were chosen for comparison. Following this, a value analysis was performed, and a product was selected that met the requirements in terms of both quality and price.

**Keywords:** Value, Material Selection, Value Engineering, Value Analysis, Cost Function Analysis

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# Automation of Database Management Systems With Machine Learning Methods

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## Abstract

Database Management Systems (DBMS) are integral to the process of data analysis for informed decision-making, forecasting, and cost reduction. However, the efficacy of these systems is contingent upon a multitude of variable configuration parameters, rendering the quest for an optimal configuration inherently challenging, designated as an NP-hard problem. Consequently, efforts are underway to develop systems that autonomously configure databases using machine learning methodologies.

This study involves the use of sample datasets taken from real customers of 45 companies in accordance with KVKK (Turkish Data Protection Law), a data set of 100 GB in size, consisting of 10 million rows and 8 columns. Given the sampled dataset's inclusion of both labeled and unlabeled parameters, supervised (Classification) and unsupervised (Clustering, K-Means, Apriori) Machine Learning Algorithms were applied. The objective was to automatically delineate indexes, ascertain critical parameters, and expedite operations by furnishing automated metric values to these parameters, thereby ensuring enhanced operational security, independent of individual intervention. Due to the continuous updating of the database, it is planned to develop a system that can intervene and modify values or provide alerts when unexpected situations arise in the system.

The findings of this research is depicted graphically, facilitating the identification of the most efficacious anomaly detection and machine learning algorithms. These discerned algorithms is subsequently integrated into development endeavors aimed at the incorporation of automatic database management system applications.

**Keywords:** Machine Learning, Database Management Systems, Automation, Classification, Clustering, Regression, Appriori, Anomaly Detection

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# A Review of the Graph Convolutional Networks (Gcns)

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## Abstract

Graph Neural Networks (GNNs) are a type of deep learning that can work with graph-structured data in non-Euclidean space. Graph structured data includes nodes and edges. A node represents an entity, while edges represent the directed relationship between entities. Graph Convolutional Networks (GCNs) are a specific type of GNN that use graph convolutional operations to learn from the graph structure, similar to Convolutional Neural Networks (CNNs). These approaches have shown immense potential in various applications such as drug discovery, social network analysis, recommendation systems, transportation networks, and complex graph data that CNNs cannot solve. In machine learning (ML) algorithms, there is generally an assumption that there is no relationship between inputs except for time series. However, as can be seen from examples such as social networks, interatomic relationships, friendships, or quotations in articles, there are interactions and relationships. However, there are still challenges to overcome, particularly regarding scalability and interpretability. Despite these hurdles, GNNs are undoubtedly a promising direction for developing more sophisticated ML models capable of handling complex data structures. Pytorch Geometric, Deep Graph Library (DGL), Spectral, and Graph Nets libraries have been developed for GNNs. In this paper, we aim to analyze the latest developments in GCNs, which methods are used in the data preprocessing step for graph-type data, and to provide a perspective on future studies in this field.

**Keywords:** Graph neural network, Graph convolutional networks, Machine learning

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# Integration of DevOps Processes with Agile Methods and Use of DevOps Tools in Software Projects

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## Abstract

The primary goal of software development today is to deliver high-quality products that respond quickly and effectively to customer needs. In this process, it is critical to deliver the software quickly, test it effectively, and improve it with continuous feedback. DevOps approaches, which aim to manage the software development life cycle and infrastructure processes more effectively, include a series of tools and applications that aim to provide high quality, fast services. By using agile methods and DevOps tools together in software development processes, it is aimed to shorten the completion time of projects and provide rapid response to changing requirements. Integration and use of Agile methods and DevOps tools optimize software development processes, contribute to the successful completion of projects and achieve the desired results more effectively. This integration enables greater collaboration and communication between teams, rapid software delivery, and effective management of continuous integration and deployment processes. The DevOps approach allows projects to evolve based on user feedback and fosters a culture of continuous improvement by facilitating customer-focused improvements. There are DevOps tools that can be used at different stages of agile software development processes, and these tools perform many important functions such as ensuring fast and reliable deployments, optimizing continuous integration and continuous delivery processes, tracking and analyzing errors by automating software development processes. It is an important research topic for software developers to know these tools and use them at the right stages. In this study, the potential of DevOps tools to contribute to projects is examined with literature sources and DevOps tools that can be used in agile methods are explained.

**Keywords:** Software Development, DevOps Tools, Continuous Integration, Continuous Deployment, Software Testing

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# A Study on Applications Using Autonomous Agents Based on Large Language Models

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## Abstract

Nowadays, large language model based applications have become very popular and are developing rapidly. Artificial intelligence models such as GPT have become more well-known, especially with the launch of ChatGPT. Today, many innovative applications use GPT via the OpenAI API. Applications that use LLM serve various purposes, sectors and segments.

Our research focuses on the use of large language model-based autonomous agents in the field of computer engineering. Specifically, it focuses on its use in the software development industry. ChatDEV and MetaGPT applications, in a nutshell, aim to outsource tasks requiring human resources to artificial intelligence. These applications aim to simulate a real software team and establish a virtual software team. People such as CEO, programmer, tester, designer and reviewer, who work in a real team, serve as autonomous agents with artificial intelligence in ChatDEV and MetaGPT. In this way, it is aimed to develop software in a much shorter time, without the costs of a real team.

In our study, we describe the software we need for both applications in a few sentences in Turkish. Agents communicate with the OpenAI API. They ask questions and receive answers in line with their needs. At the same time, agents can also communicate among themselves. For example, the programmer sends the code he wrote to the tester, the tester tests the code and sends the errors he detects back to the programmer. The programmer solves the problem and sends it back to the tester. The code that is confirmed to work is sent to the reviewer, etc.

10 predetermined software scenarios, from simple to complex, were given as input and the outputs were examined. The performances was examined based on critical variables such as time and cost and the results were compared. As a result, the applications achieved high success.

**Keywords:** Large Language Models, ChatDEV, MetaGPT, Artificial Intelligence, Software Development

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# Comparison of Structured Light Method and Stereo Vision Technique in Terms of Depth Estimation for the Benefit of Blind People Navigation

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## Abstract

In this paper, stereo vision and structured light methods which are used in depth setimation and 3D reconstruction are presented in terms of the methods used and several aspects such as cost, applicability, ease of use etc. These techniques have been used for years by researchers in the field of computer vision and machine vision. In Structured light method (also known as “active illumination method”), a projector and a camera are placed next to each other (slightly displaced from each other) to shine a light on and take images of objects. The projector (light source) is mostly a laser pointer and the camera is a usual RGB one. In the simplest case, the laser pointer emmits one ray of light and the camera sees the projected point on the surface of an object in front. By using triangulation method, distance from baseline (the line which connects the camera center and the projector) can be calculated. The most famous example for this technique is “Kinect”. As for stereo vision technique, the system has identical two cameras which are located slightly different from each other similarly. But the main difference betwen them is that the system has a camera instead of the projector. By using these methods, a depth map (distance from camera) can be obtained. Whereas these techniques have an advantage over a single camera, there are some challenges in their implementation. The two techniques are commonly used for blind people navigation for he purpose of finding safe path (path with no obstacle)

**Keywords:** Structured light, Stereo vision, Dept estimation, 3D reconstruction, Range finding

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# LDAP Based Web Application

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## Abstract

Lightweight Directory Access Protocol (LDAP) is a protocol widely used in various application areas today to provide easy access to distributed directory services. It is an important tool for increasing the efficiency of organizations, ensuring security and managing complex systems in identity management, address book services, cloud services, network security solutions, organizational directories and integration solutions. It aims to manage application, software and system management in accordance with business processes and manage Active Directory processes. This approach aims to enable organizations to control and implement applications without requiring a remote desktop connection to servers. The user accounts and groups created on the system are created in an infrastructure that can be integrated as a contribution to other software processes to be developed. Login and role authorizations for software systems that require a username and password can also be controlled through the system. It is ensured that user account information is used, transmitted and verified by a single data source via the Application Programming Interface (API) to the side applications to be developed. System integration aims to increase system efficiency by enabling different software to work collaboratively. In this context, functions such as automatic e-mail or SMS services are integrated into user accounts. This approach preserves data integrity and security while improving user experience. This integration allows access control systems in institutions to work with up-to-date information. The synchronized movement of user information ensures data integrity and prevents information pollution by feeding other applications.

**Keywords:** Lightweight Directory Acces Protocol, Active Directory, Domain Controller, Access Control, Authorization

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# OpenCV-Based Motion Process Analysis in Animal Experiments

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## Abstract

Today, the study of animal behavior is recognized as an important area of research in many disciplines, from neuroscience to ethology. Research in this field is used in a wide range of areas to understand how animals interact with their environment, observe their natural behavior, and explore their neurological mechanisms. However, tracking and monitoring animal behavior in such experiments is highly complex. Traditional methods involve researchers performing analyses based on the notes they take during the experiment. These methods lead to errors, time losses, and misleading results. To address these issues, a video tracking application was developed using image processing and pattern recognition methods, the Python programming language, and the OpenCV library. This application, designed to analyze animal behavior experiments, enables researchers to track the movement of experimental animals in a specific region and easily perform detailed analyses. By utilizing the video processing functions of the OpenCV library, it is possible to determine the experimental area according to the experimental platform within the application, detect important points such as the start, end, and Region of Interest (ROI), and obtain movement time, speed, coordinates, route, and other statistical information about the animal in a selected region. This study proposes an application that successfully detects and positions the experimental area and experimental animal without user intervention, significantly reduces the working time, and provides results on distance, time, speed, and acceleration parameters. It is considered that this application will contribute to the literature and researchers.

**Keywords:** OpenCV, Motion Detection, Image Processing, Video Processing, Contour Detection

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# Anomaly Detection by Contrastive Learning of Real-Time Physiological Signals

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## Abstract

Physiological signals obtained from humans are important in many fields, especially in health. AKTIVES is a dataset that utilizes physiological signals for stress detection. This dataset includes blood pressure data obtained while children with various health conditions (obstetric brachial plexus injury, dyslexia, intellectual disability, and typically developed) are playing, and the images are labeled by experts to determine stressful and non-stressful situations. When anomaly detection is performed with this dataset, a person under stress can be considered as an anomaly. This is because accepting a certain condition as normal allows other conditions to be defined as abnormalities. Contrastive Learning is a deep learning method that has emerged to be used on unlabeled data. Anomaly detection in time series data is often a challenging problem due to the lack of labeling. To overcome this problem, a study has been conducted using Contrastive Learning deep learning technique. In this study, a model created based on Contrastive Learning aims to detect anomalies in the AKTIVES dataset containing time series data. This model, which focuses on anomalies being considered as stressful situations, is trained individually for each child in the dataset to distinguish between stressful and stress-free situations for personalized stress monitoring. The results show that a model operating with a personalized approach rather than training and testing on all data can more successfully identify stressful situations as anomalies. The aim of this study conducted within the scope of a master's thesis is to highlight the potential contribution of deep learning methods, such as Contrastive Learning, particularly in health monitoring systems or applications assessing children's welfare.

**Keywords:** Contrastive Learning, Anomaly Detection, Pyhsiological Signals

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# The Effect of Feature Selection Methods on the Performance of Classification Algorithms

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*Mete YAĞANOĞLU*[3]

## Abstract

With the increase in big data sets, the importance of increasing performance and fast runtime in machine learning has increased. For this purpose, many remedial operations are performed before and after machine learning. With these processes, solutions are produced that will lead to accurate results and the aim is for these solutions to yield rapid results. Before learning takes place, data pre-processing and feature extraction methods are the main ones. Feature selection, such as the pre-processing stage and feature extraction, is also of great importance. Because it is not certain that all the features extracted from the data sets will have a positive impact on performance, some features may have a similar effect or reduce performance as a result of machine learning. For this purpose, all features should be examined using feature selection methods and their effects on the result should be investigated. In this study, the impact of feature selection methods on the results of classification algorithms, which is a field of machine learning, and how they will affect performance were investigated with a sample data set. Various feature selection techniques such as Recursive Feature Elimination, SelectKBest and Principal Component Analysis were applied in this study. Additionally, a total of seven classification methods were used to analyze the data. The highest accuracy in the features selected by the Recursive Feature Elimination method was found to be 87% in Random Forest and Gradient Boosting classifications.
**Keywords:** Feature Selection, Classification, Machine Learning, Feature Extraction, OULAD

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# Remote Management of Drinking Water Networks with MQTT Protocol

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## Abstract

Water is a crucial element for life, and drinking water networks are pivotal for sustainable water management and distribution. Escalating water scarcity emphasizes the need for efficient water management and resource utilization. This study explores the effective management of drinking water networks and the integration of Internet of Things (IoT) technologies. The applicability of the Message Queuing Telemetry Transport (MQTT) protocol in drinking water networks is particularly examined. MQTT stands out as a lightweight, reliable, flexible, and low-bandwidth communication protocol suitable for IoT applications. By implementing MQTT in drinking water networks, real-time monitoring, analysis, and intervention of sensor data becomes feasible. The study delves into the utilization of MQTT in drinking water networks, its application areas, and the advantages it offers. Additionally, an exemplary application is presented to demonstrate the effectiveness and efficiency of the MQTT protocol. The case study involves real-time monitoring, analysis, and notification of drinking water data transmitted to the internet via MQTT. Conclusively, remote monitoring and control of drinking water networks with the MQTT protocol can significantly contribute to water security and sustainability by enabling more efficient water resource management. This study aims to serve as a valuable resource for water utility managers, academics, and water sector professionals, while providing a comprehensive overview of IoT concepts and the MQTT protocol.

**Keywords:** Drinking water networks, mqtt protocol, remote control, IoT, data communications

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# Utilizing Turkish Natural Language Processing and RAG in Chatbot Systems: Approaches Based on ChatGPT and Generative AI

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*Alper ULUSOY*[3]

## Abstract

Automatic response generation in chatbot systems through Turkish language processing and retrieval-augmented generation (RAG) presents a promising area of research. The core components and functions of systems developed using generative AI, large language models (LLMs), and vector databases are central to these advancements. Specifically, an automatic response system based on ChatGPT, integrated with Azure OpenAI API, is discussed. This system can read data from provided websites or documents and produces consistent and contextually appropriate responses through dialogue memory. The efficiency of Turkish natural language processing (NLP) techniques is enhanced by maintaining the desired context in responses using prompt engineering. By leveraging the capabilities of ChatGPT and integrating RAG technology with vector databases, the system offers more accurate and relevant answers, improving user satisfaction. Additionally, web sources are filtered to ensure the quality and relevance of the data used, addressing concerns about the reliability of external information.

The enrichment of the system with RAG technology and the challenges and solutions encountered during the processing of user-specific data are detailed. This includes handling large volumes of data, ensuring data privacy, and optimizing the retrieval and generation processes to deliver timely and precise responses. Innovative methods and applications developed to improve the effectiveness and user experience of chatbot systems are also discussed, highlighting the potential of these technologies to revolutionize human-computer interaction.

**Keywords:** chatbot, generative AI, Turkish NLP, RAG, ChatGPT

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# Comparison of Traditional and Modern Approaches on Chatbot Dataset

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## Abstract

Today, artificial intelligence-supported chatbots are widely used around the world and their popularity is rapidly increasing due to their language models known as generative artificial intelligence. Chatbots are a category of artificial intelligence programs designed to replicate communication processes via text or voice, known for their capacity to deliver responses to users' inquiries that closely resemble human accuracy. During user interactions, these bots frequently emulate communication by utilizing keywords and structures stored in a database. They employ artificial intelligence, automated rules, natural language processing (NLP), and machine learning (ML) to analyze data and generate responses to various requests.

In this study, on a chatbot dataset used in real-world application and created using the Langchain framework Retrieval Augmented Generation (RAG); comparison of traditional methods such as TF-IDF, Word2vec, Glove and Fasttext and modern methods such as BERTurk, ConvBERTurk, DistilBERTurk and Electra are discussed. During the comparison, basic measurements such as accuracy, precision, recall, and F1 score were considered, and taking into account the training times and the number of epochs, the most effective model for the chatbot dataset were determined. Chat robots used in most of the studies in literature were developed usually in English by researchers for the purpose of their studies. Turkish chatbots are rarely studied in literature because of the challenges due to the language's agglutinative structure, and which requires processing complex morphological variations, and the limited availability of high-quality training datasets compared to more widely studied languages like English is. In our study a Turkish chatbot, that is previously used in real life is used, and more and different models are obtained than existing studies.

**Keywords:** Chatbot, largelanguagemodels, langchain, finetuning, naturallanguageprocessing

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# Identification of Fusarium Verticillioides and Fusarium Proliferatum Species Causing Problems in Maize Cultivation Areas In Turkey by Some Molecular Methods

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*Himmet TEZCAN*[2]

## Abstract

In this study, Fungal isolations were made with Potato Dextrose Agar according to the basic isolation rules in plant pathology, and the Fusarium species obtained were purified and single spore cultures were obtained. Pure cultures were transferred to sterile 1.5 ml Eppendorf tubes containing 100 µL sterile water by scraping the hypha layer with a sterile spatula. For homogenization, the tubes were vortexed at 3000 rpm for 1 min. Then, 10 microliters of lyticase enzyme was added to each tube and incubated at 37 oC for 30 minutes and DNA isolation was started. For DNA isolation, Roche brand manual DNA isolation Kit (Roche High Pure Nucleic Acid Kit) was used and the study was carried out in accordance with the kit's protocol. Then, the obtained DNAs were measured on the Nanodrop device and DNA quantity and quality determinations were made. In the study, specific SNP (Single Nucleotide Polymorphism) molecular marker was used for Fusarium verticillioides and PRO1 and PRO2 specific SSR marker was used for Fusarium proliferatum. The obtained PCR products were run on 3% agarose gel with an electrophoresis device. After the gels were run, they were viewed on the gel documentation device and the band images were interpreted. In addition to specific molecular markers, gene sequence analysis was performed using the 'Sanger Sequencing' method, and specific Fusarium spp. DNA sequences amplified by PCR with the EF1-EF2 primer pair, which is a marker, were determined by comparing the sequences obtained with the sequences available in international data banks such as NCBI. As a result of the study, 13.3% of the 157 isolates obtained from the survey studies conducted in the Aegean region were determined to be Fusarium verticillioides and 22.2% were determined to be Fusarium proliferatum.

**Keywords:** Corn, Fusarium verticillioides, Fusarium proliferatum

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# The effect of caprylic acid and garlic supplemented feed on gill parasite (Sparicotyle chrysophrii) infection in gilthead sea bream

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*Mehmet GÜLER*[3]
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Abstract

*Sparicotyle chrysophrii* (Van Beneden and Hesse, 1863) is a monogenean gill parasite infects especially gilthead sea bream (*Sparus aurata*, L. 1758). Parasite's pathogenic effect is haematophagous and causes severe gill lesions. Garlic is a plant that is effective against various fish parasites. Caprylic acid is a medium-chain fatty acid, has antimicrobial and antiparasitic properties and has a positive effect on gut health in animals. In this study, the antiparasitic effect of a commercial feed additive based on caprylic acid and garlic powder was investigated against *Sparicotyle chrysophrii* in a gilthead sea bream net cage facility in Türkiye. The additive was added to the feed at a rate of 5 kg/t. Fish were sampled monthly (April - August) from 2 control and 2 experimental groups. The weights of the sampled fish varied between 136 and 650 grams. Gill lamellae were examined under a light microscope. Also, infected gill lamellae were placed in a formaldehyde solution. The variation of parasite density with respect to feed additive and fish weight during the trial was tested by a generalized linear model (GLM). The parasite caused hyperplasia, edema, and telangiectasia in the gills. The mean parasite number (number of parasites/fish) of the parasites in fish fed with feed additive decreased from 5.3 in April to 0.7 in August, but there was an increase in June as 4.5. The mean parasite number in the control group peaked in June. The number of parasites decreased monthly in general ($p<0.05$). There was a limited change in parasite numbers according to fish weight ($p<0.05$). There was no significant difference in the number of parasites between no-additive and additive groups ($p>0.05$) however, the additive was found to be effective in reducing the number of parasites within months ($p<0.05$).

Keywords: Gill parasite, antiparasitic effect, gilthead sea bream, feed additive, fish farming

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# Effects of Na-Humate and Ca-Humate Application on the Cold Hardiness of Lettuce (Lactuca sativa L.)

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## Abstract

Global climate change worldwide in recent years caused some imbalances in climatic conditions arising during the plant growing period and agricultural production has been negatively affected. Lettuce is one of the most sensitive plant to cold stresses in the early development stage and low temperatures causes yield losses. This research was conducted during the period from May to the end of June 2012 to assess the effects of Na-humate and Ca-humate applications on the cold hardiness of lettuce under field conditions. The experiment was designed according to a completely randomized experimental design, with 3 different fertilizer applications (Control, Ca-Humate, Na-Humate), 5 different application doses (0, 1, 3, 9, and 12 kg/ha), and 3 replications. The data obtained from the study revealed statistically significant effects of Na-humate and Ca-humate applications on certain soil properties and yield components of the lettuce plant. The highest yield parameters were observed with application doses of 9 kg/ha of Na-humate and Ca-humate. Furthermore, Na-humate and Ca-humate applications significantly influenced the cold damage rate of the lettuce plant, with the lowest damage occurring at the highest application doses. Compared to the control, Na-humate and Ca-humate applications reduced the cold damage rate of the lettuce plant by 34.12% and 26.75% at 0°C, 28.53% and 31.43% at -5°C, 36.98% and 32.73% at -10°C, 33.36% and 27.20% at -15°C, and 18.92% and 19.44% at -20°C, respectively.

**Keywords:** Na-humate, Ca-humate, lettuce, cold damage

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# Effects Of Serum Oxıde ($Ceo_2$-Np) Applıcatıon On Salt Stress On Mıneral Materıal Change In Grafted And Ungrafted Vıne Saplıngs

*Hasan BALTACI*[1]
*Seda SUCU*[2]
*Sezer ŞAHİN*[3]

## Abstract

In this study carried out in 2022, the effects of cerium oxide ($CeO_2$-NP) nanoparticles on salt stress in grafted and ungrafted vine saplings were investigated. In the study; 5 BB , 1613 C vine rootstocks with different salt sensitivities, and ungrafted saplings of Sultani Çekirdeksiz variety grown on their own roots and grafted seedlings of Sultani Çekirdeksiz variety grafted on these rootstocks were used. Salt stress was applied to plants at three levels as 0, 25 and 75 mM NaCl, and cerium oxide ($CeO_2$-NP) nanoparticle applications were applied to plants at four different levels (0, 25, 50 and 100 mg $L^{-1}$).In nutrient analysis, some of the macronutrients (N, Mg,Ca) and micronutrients (Fe, Zn, Cu,Mn) were examined. Although the values vary according to the nutritional elements, salt stress and cerium oxide concentration, the differences were found to be significant in many elements. The applied doses of cerium oxide showed varying effects depending on the rootstocks as well as different salt concentrations. While 100 ppm cerium oxide application had a positive effect on nitrogen nutrient uptake in 5 BB rootstock in 0 salt (control) and 25 salt applications, it had a negative effect in 75 salt application. Likewise, when looking at zinc, one of the micronutrient elements, cerium oxide 100 ppm application on 1613 rootstock had a positive effect under 0 salt, while it had a negative effect under 25 and 75 salt applications.

**Keywords**: Sultani Çekirdeksiz, 5 BB, Calcium, Magnesium

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# The Effect Of Usıng Normal And Nıtrogen Stabılızed Urea As Top Dressıng Fertılızer On Yıeld And Some Yıeld Components İn Bread Wheat At Dıfferent Growth Stages

*Ali Bahadır KÜR*[1]
*Hatun BARUT*[2]
*Sait AYKANAT*[3]

## Abstract

This study was carried out to determine the effect of using normal and nitrogen stabilized urea as a top dressing fertilizer on yield and some yield components of wheat at different developmental stages (stem elongation, booting, heading, early milk stage, late milk maturity) between 2020 (November) and 2021 (June) under Çukurova conditions. Field studies were carried out in an area where no base fertilizer was applied, only under top dressing condition. In this study, AS (21% N), Urea (46% N) and NSN with nitrogen stabilizer (46% N) fertilizers were used as topdressing materials and "Yakamoz" wheat variety was used as seed material. Field trials were conducted as two separate trials according to fertilizer material. In both trials, during the tillering period; AS fertilizer was used as 6 kg N/da per unit area in the first top fertilization. In the second top dressing, Urea and Nutrisphere-N (NSN) fertilizers were used at 5 different times at a rate of 10 kg N/da per unit area. The experiments were established in a planting norm of 450 pieces/m2 with 3 replicates according to the randomized blocks experimental design. In the experiments; the effects of fertilizer applications on plant height, spike number, thousand grain weight, hectoliter weight and yield of wheat were investigated.

According to the results of the research; in both trials, the effects of normal and nitrogen satabilizer urea on plant height, number of spike, thousand grain weight and hectoliter weights in the second top dressing at different growth stages of wheat were not found to be statistically significant; however, it was determined that it caused differences on yield values at 5% significance level. In both fertilizer trials, the highest yields were obtained from the applications at the booting period. Yield values of 748.09 kg and 880.68 kg per decare were obtained from Urea and NSN fertilizers applied during the booting period, respectively. The application of urea with nitrogen stabilizer (NSN) as the second top fertilizer in the booting period caused 17.72% more yield than the normal Urea application in the same period.

**Keywords**: Çukurova, wheat, second top dressing, nitrogen stabilizer, yield

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# The Effect Of Soıl And Foliar Applıcatıons Of Dıfferent Lıquıd Fertılızers On Yıeld And Some Yıeld Parameters İn Bread Wheat At Dıfferent Growth Stages

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## Abstract

This research was carried out to determine the effect of different liquid fertilizer applications on yield and some yield components of wheat at different developmental stages of wheat during the wheat growing season between 2020 (November) and 2021 (June) under Çukurova conditions. Field studies were carried out in an area where no base fertilizer was applied and only under top dressing condition. In this study, UAN (32% N) and NSF (28% N) fertilizers were used as liquid fertilizer materials and "Yakamoz" wheat variety was used as seed material. Field trials were conducted in two separate experiments according to fertilizer material. The trials were established with 3 replicates according to the randomized blocks experimental design at a sowing norm of 450 pcs/m2. In the liquid fertilizer UAN trial, applications were made from the soil, while in the liquid fertilizer NSF trial, applications were made from the foliar. In both trials, fertilizer applications were made at 5 different developmental stages of wheat (tillering, stem elongation, booting, heading, grain milk stage). UAN fertilizer was applied at a dose of 35 kg/da (26.11 lt/da) and NSF fertilizer was applied at a dose of 25 kg/da (20 lt/da). While urea was not applied in the UAN trial, 35 kg urea/da per unit area was applied in the NSF trial. The effects of the treatments on plant height, spike number, thousand grain weight, hectoliter weight and yield of wheat were examined in the trials.

According to the results of the study, the effects of UAN fertilization on thousand grain weight (g), hectoliter weight (kg/hlt) and spike number (pcs/m2) were not found statistically significant, while the effects on yield (kg/da) and plant height (cm) were found statistically significant. According to the results of NSF experiment, the effects of foliar applications on hectoliter weight, plant height and number of spike values were not found statistically significant at different growth stages of wheat. The effects of foliar NSF fertilization on yield (kg/da) and thousand grain weight (g) were found statistically different at 5% significance level.

As a result, the highest yields in both fertilizer trials were obtained from the applications at the spike stage. The yield values of 882 kg and 783 kg per decare were obtained from UAN and NSF fertilizers applied during the spike period, respectively. UAN fertilizer applied through soil during the spike period caused 12.61% more yield than NSF fertilizer applied through foliar application in the same period.

**Keywords**: Cukurova, wheat, liquid fertilizer, UAN, NSF, yield

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# Allelopathic Potential of Lupin (Lupinus spp.)

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## Abstract

Weeds are plants that we do not want to be found in or outside agricultural areas and that cause more damage than benefit. They compete with cultivated plants for water, light and nutrients, causing yield loss and quality. For this reason, it is important to control weeds. The most common method used to minimize yield and quality loss is chemical control. However, the use of pesticides brings with it many problems such as negative effects on human health and the environment. As a result of intensive and unconscious use, the pesticide itself or its components may remain in food, soil, water and air. The risk of residues in agricultural products and their negative effects on the environment that may occur as a result of the use of pesticides, which are an integral part of the agricultural system all over the world, is an issue that should be carefully considered. Although these negative effects are not taken seriously by producers, they can actually cause significant yield losses. For this reason, studies in the field of Allelopathy as an alternative to chemical control have gained importance. On the other hand, the goal of reducing the amount of pesticides used in the European Union by 50% by 2030 also supports this. Lupins (Lupinus sp.), with their high protein content and ability to grow in marginal areas where other legumes do not grow, are an important legume plant of the Fabaceae (Leguminosae) family. Lupins are known as Termiye or Lupin in Türkiye. It contains various allelochemicals. There are many herbicides used to manage weeds. Due to the negative aspects of herbicides, many studies have been conducted recently on the use of environmentally friendly bioherbicides. It is aimed to use these allelochemicals secreted by plants as an alternative to pesticides. That is why allelopathy is important in the interaction of weeds with each other and with cultivated plants. When we evaluate the lupin plant from this perspective, various allelopathic reactions have been reported and it is a promising plant in this regard.
**Keywords:** Lupin, Lupinus spp., Allelopathy, Weed management, Bioherbicide.

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# Inhibitory effects of marination on the microbiological quality of anchovy (Engraulis encrasicolus) fillets inoculated with Morganella psychrotolerans during cold storage

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## Abstract

The study aimed to assess the inhibitory effects of various marination conditions (1, 2, 3, 4% acetic and 6, 8, 10% NaCl) on the microbiological growth of anchovy fillets inoculated with Morganella psychrotolerans during refrigerated storage for three months.

The study samples comprise 14 groups, two control groups, and 12 treated samples. 10 g anchovy produced for sampling was blended with 90 mL prechilled sterilized ringer solution. Additional decimal serial dilutions were then used from the homogenate. For the isolation of total psychrophilic bacteria, Plate Count Agar (PCA) was used. M. psychrotolerans was isolated through the spread of the mixed samples on Tryptic Soy Agar plates and incubation was carried out at 25oC for 48h. CFU/g.

Based on the outcome of the findings, marination had strong inhibitory effects on the growth of Morganella psychrotolerans as the groups treated with 3% and 4% acetic acid had more retarding impact on the growth of M. psychrotolerans and total psychrophilic bacteria, as there was no observation of bacterial cell in the groups with the addition of this treatment from the beginning of the investigation to the end. Lactic acid bacteria growth was inhibited in the groups treated with 2%, 3%, and 4% acetic acid.

This findings of study reveals that marination which is combined with high concentration of NaCl and acetic acid had strong inhibitory effects on the growth of bacteria during refrigeration storage, thereby, this method of processing can be incorporated in fish preservation to prevent spoilage, contamination and to ensure safety of fish for consumers.

**Keywords**: Morganella psychrotolerans; Marination; Acetic acid; Anchovy; NaCl.

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# The relationship between Fusarium species and grapevine trunk diseases, and the in vitro control of the most virulent isolates

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*Mert BARAN*[3]

## Abstract

Despite numerous studies associating *Fusarium* spp., one of the most prevalent fungal species in nature, with the decline of grapevines for many years, the impact of these fungi on grapevine health remains a topic of debate. This study characterized *Fusarium* spp. isolated from grapevine nurseries in Manisa province, Turkiye, molecularly through the Internal Transcribed Spacer (ITS) gene region and elucidated their association with grapevine trunk diseases (GTDs) observed in grapevine saplings through pathogenicity tests conducted with 1103 P rootstock. The study also evaluated the efficacy of four common fungicides and two antagonists isolated from grapevines against *Fusarium* spp. determined to be most virulent in vitro.

Molecular diagnosis identified 11 *Fusarium* spp. isolates from necrotic parts of grapevine saplings. These isolates were identified as *Fusarium avenaceum* (1), *F. oxysporum* (2), *F. solani* (3), *F. proliferatum* (3), and *F. brachygibbosum* (2). All identified *Fusarium* spp. were tested for pathogenicity, and the two most virulent species, *F. avenaceum* and *F. proliferatum*, were selected for in vitro studies. All tested fungicides significantly inhibited the mycelial growth of *F. avenaceum* and *F. proliferatum* isolates compared to the control (pathogen only). Prochloraz, cyprodinil + fludioxonil, and tebuconazole were most effective in inhibiting the mycelial growth of both pathogen species, followed by difenoconazole. In dual culture tests, antagonists *Trichoderma harzianum* and *Clonostachys rosea* isolated from grapevines significantly inhibited the mycelial growth of both *F. avenaceum* and *F. proliferatum* isolates by >90% on the 27th day. This study revealed that *Fusarium* spp. isolated from necrotic areas of grapevine saplings cause necrosis in grapevines such as GTDs. Although the tested fungicides and antagonists showed significant success against *F. avenaceum* and *F. proliferatum* isolates in vitro, further studies under in vivo or field conditions are needed for better inference.

**Keywords:** *Clonostachys rosea*, fungicide, *Fusarium*, grapevine trunk diseases, *Trichoderma harzianum*,

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# Risk Management in Agricultural Enterprises in Çubuk District of Ankara Province

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## Abstract

The aim of this study is to reveal the perceptions of farmers about risk in agricultural production in agricultural enterprises in Çubuk district of Ankara province. In the farms examined within the scope of the study, demographic characteristics, general characteristics of the farms, credit use, income evaluation, information sources, risk sources and risk management strategies were investigated. The material of the study consisted of data obtained from primary and secondary sources. Data obtained from surveys administered to farmers in agricultural enterprises in the research area constituted the primary source of the study. In the research, a survey was applied to farmers in 30 agricultural enterprises between September and December 2022. According to the findings of the research, the average family size in farms is 2.83 people, the average age of farmers is 49.3 years and the experience in agricultural production is 31.9 years. It was determined that records were kept in 63.3% of the examined farms, 83.3% were partners in the Agricultural Credit Cooperative and 50% used loans for agricultural purposes. In the study, the risk sources expressed by farmers as very important among the risks encountered in agriculture are; changes in product yields, financing without equity capital, damage to the product due to fire, damage to the product due to flood, changes in climate conditions and insufficiency of family labor. Farmers stated that among the risk management strategies that can be applied against risk sources, producing at the lowest cost possible, having information about past product prices, fighting against diseases with drugs and enlarging the farm land are very important.

**Keywords**: Agriculture, Risk management, Strategy, Credit, Ankara

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# Bacterial Canker and Gummosis (*Pseudomonas syringae* pv. *syringae*) on Apricot Trees in Malatya Province

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*Yusuf KARAKUŞ*[2]

## Abstract

Turkiye ranks first in dried apricot production worldwide. Apricot constitutes a significant source of income for Malatya. Malatya alone accounts for the majority of dried apricot production in Turkiye. While apricot production provides significant economic contributions, serious losses occur due to some diseases and pests. In recent years, symptoms of branch dieback and gummosis on the main branches and trunks of apricot trees have been increasing. Surveys conducted in the region revealed symptoms of the bacterial pathogen *Pseudomonas syringae* pv. *syringae* in substantial quantities. *P. syringae* is one of the bacterial pathogens causing significant damage to many plant species. When infected, *P. syringae* creates cancer symptoms in the woody tissue of the plant and eventually kills the branches by covering the entire tree. This research aims to reveal the general status of *P. syringae* causing cancer and dieback in apricot trees in Malatya province, which results in significant economic losses, and draw attention to this relatively understudied issue. Accordingly, plant samples were collected from apricot orchards where surveys were conducted based on macroscopic symptoms and brought to the laboratory. Species isolated from symptomatic plant samples were characterized microscopically and diagnosed by comparison with reference isolates. As a result of isolation and diagnosis, it was revealed that *P. syringae* is widespread in each region. It is crucial to take necessary cultural and chemical measures promptly against *P. syringae*, whose prevalence is increasing daily and control is quite challenging.
**Keywords:** apricot, canker, *Pseudomonas syringae* pv. *syringae*, prevalence

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# Use of Mushroom as a Growing Medium in Rosemary (*Rosmarinus officinalis* L.) Plant and Its Effects on Plant Development

*Tolga USLU* [1]
*Sibel ULCAY* [2]

## Abstract

Rosemary (*R. officinalis*) is a plant native to the Mediterranean region and has an important place in the field of spice and health. While rosemary oil is used for skin and hair care, its tea also supports digestion. With its antioxidant content, it not only strengthens the immune system but also has mental performance-enhancing properties. In this study, it is aimed to carry out plant cultivation by using organic materials instead of chemical fertilizers in the cultivation of rosemary, which is an economically and medicinally important plant, and to contribute to the country's economy by recycling the materials used as waste. In addition, it is aimed to increase the efficiency in agricultural production by using different organic substances, including mushroom waste, to enrich the soil and to provide new cultivation techniques to our producers. Recycling is an important process that contributes to the protection of natural resources by making waste reusable. In this study, the effect of different growing media on the yield and yield components of rosemary plant was investigated. The experiment was set up in the application greenhouse of Kırşehir Ahi Evran University Faculty of Agriculture with 4 replicates, with 12 plants in each replicate. Different doses of mushroom waste (2%, 4%, 6% and 8%) and control treatment were used as growth media. As a result of this study, parameters such as pepper plant height, number of branches per plant, fresh herb yield per plant, and dry herb yield per plant were examined. Considering the data obtained as a result of the study, it was determined that 8% dose of mushroom waste application contributed positively to the yield of rosemary plant.

**Keywords:** Rosemary, recycle, yield, growing medium, mushroom

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# Ergonomic Improvement of Chicken Doner Kebab Production Line

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*Sevban AZMAN*[3]
*Oğuzcan AKIN*[4]

## Abstract

Ergonomics has a critical importance for the health, safety and productivity of employees, especially in mass production enterprises. By providing an ergonomic environment in enterprises, it provides long-term gains for both employees and employers such as preventing musculoskeletal diseases, reducing the risk of accidents, reducing stress and fatigue, increasing performance, improving workflow. In this project, the doner filling line in the chicken meat processing plant was examined ergonomically. In the filling line, the personnel lift the sauced chicken meat crates and place them into the doner moulds in order to give them a cylindrical form. RULA (Rapid Upper Limb Assessment) analysis was performed to assess the potential risks on the musculoskeletal system of the personnel working in the relevant process. Since the personnel manually lift a crate loaded with meat in the process, NIOSH (National Institute for Occupational Safety and Health) analysis was also performed to evaluate the ergonomic risks that may be experienced in load handling. When evaluated with the relevant scoring tables in the RULA analysis, the wrist/arm score was found to be 9 and the head/body/leg score was found to be 4. According to these two scores, it was concluded that the total RULA score was 7, that is, the personnel were working in a bad position that posed too much ergonomic risk. In the NIOSH analysis, RWL (Recommended Weight Limit) was determined by using a load constant (LC) with the age of the personnel, a horizontal multiplier (HM) with the distance between the weight and the centre of the body during lifting, a distance multiplier (DM) with the height of the hands from the ground, a asymmetric multiplier (AM) for the vertical distance the weight moves, an vertical multiplier (VM) for the weight rotation angle, a repetition number multiplier, a weight holding factor (V). Then, the lifting index was calculated using RWL and determined as 1.50. In the NIOSH assessment, ‘hazardous’ matching was made because the lifting index was between 1-3. As a result of the analyses, it was determined that there was an ergonomic risk in the personnel working in the relevant process and a mechanical design was carried out to automate the process.

**Keywords:** Ergonomi, RULA, NIOSH, proses, risk analyses.

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# A Literature Review on the Analysis of the Factors Affecting the Readiness tf Cities for Autonomous Vehicles

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## Abstract

With the rapid increase and development of autonomous vehicle technologies, the integration of these vehicles into cities has become important. Vehicles have been shown to have an impact on various aspects of cities and urban life. The integration and adoption of autonomous vehicles in urban environments involves a multifaceted process that includes issues such as mobility models, infrastructure development and traffic management. With the widespread use and adoption of electric vehicles, the transition to autonomous vehicles in cities has accelerated, and the amount of carbon emissions in the transportation sector has decreased. The widespread use of autonomous vehicles in smart cities is important in shaping the future of urban transportation systems and sustainability. The use of autonomous vehicles in cities will cause an urban transformation, especially the city infrastructure. Therefore, how autonomous vehicles will affect urban mobility and the city usability of developing technology becomes important. This research aims to provide a comprehensive overview of the factors affecting the readiness of smart cities for the use of autonomous vehicles in the future, based on a review of the relevant literature. With the adaptation of autonomous vehicles to cities, urban transportation will be reshaped and sustainability and traffic safety in cities will increase. Therefore, in this study, by examining the readiness of cities for autonomous vehicles according to the literature with examples from the world and our country, answers to the research questions were sought: what are the factors affecting the adoption of autonomous vehicles in cities and to what extent do these factors affect the acceptance of autonomous vehicles in cities.

**Keywords:** city readiness, autonomous vehicles, smart cities, criterias

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# A Solution Approach To the Problem of Customer Segmentation and Customer Lifetime Value Estimation in The E-commerce Industry

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## Abstract

The opportunities in the e-commerce sector and changing customer habits have increased the importance of taking specific actions based on customer behavior. In this context, analytical approaches, statistics, and data science methodologies have been utilized in marketing activities in recent years. Being able to work with dynamic data enables companies to adapt agilely to the changing behaviors of their customers. The increasing competition and difficulty in sustaining market presence have made deriving meaningful insights from data essential. This study will utilize big data stored from the shopping behavior of e-commerce customers who made purchases in November, for the years 2022 and 2023. Data from a retail company operating in e-commerce will be used for access to data. The first objective of the study is to segment customers. In the second step, the lifetime value of customers will be estimated by calculating the expected value of all purchases made by customers in a company. Segmentation and regression algorithms from data science methods will be used. Data science approaches will also be used for estimating customer lifetime value. A two-stage approach will be presented for the analysis of customer segmentation and cluster results. Although segmentation and customer lifetime value estimation studies exist separately in the literature, a study aiming to apply both methods together specifically in the e-commerce sector, offering hybrid methods, selecting target customers suitable for the company's limited marketing budget, and predicting their expected values has not been observed. The findings of the study, after identifying customer clusters exhibiting similar shopping behavior and interpreting the results obtained from predicting customer lifetime value, will contribute to the company's marketing strategies.

**Keywords:** Data mining, customer segmentation, customer lifetime value, customer relationship management, data science

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# Cleaning Staff Shift Scheduling Problem in Urban Railway Stations

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*Mehmet PINARBAŞI*[3]
*Tamer EREN*[4]

## Abstract

In urban railways, in addition to operation and maintenance personnel, there are personnel who clean and organize the stations. Apart from cleaning duties, cleaning personnel ensure that necessary precautions are taken in the cleaning area against situations such as slipping and falling of passengers and injuries. Cleaning tasks performed many times a day pose more risks in areas with high passenger flow. Areas with high passenger density and the presence of many stations also make cleaning staff planning difficult. Apart from this, cleaning staff's duties require frequent physical movement. It is important to do work efficiently in terms of balanced and equal distribution of workloads. In this study, the shift scheduling problem of cleaning personnel working in stations is discussed. In the problem, firstly, the passenger density data of the stations have been examined. It is aimed to distribute the cleaning staff station duties evenly for each staff by proportioning the number of passengers at the stations to the monthly staff duties. A goal programming model has been used to distribute personnel needs and tasks equally and balanced at the stations. Cleaning staff scheduling is a subject that has been little studied in different fields in the literature.

**Keywords:** Goal Programming, Personnel scheduling, Railway, Cleaning Staff, Passenger numbers

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# Utilization of Simulation Method in Digitized Production Processes: The Case of Seat Production Factory

*Bilal BAYIR*[1]
*Elif ÖZKAN*[2]

## Abstract

With the advent of modern industrial revolutions, the goal has been to make production processes smarter, more efficient, and sustainable. Nowadays, with what is termed Industry 4.0, new processes incorporate technologies such as smart robots, cybersecurity, cloud technologies, big data analytics, the Internet of Things (IoT), augmented reality, and simulation. The use of these technologies aims to digitize production systems, increase control over production processes, and achieve a production that is of higher quality, cheaper, faster, and less wasteful. Simulation method, one of the Industry 4.0 technologies, is utilized in various areas such as risk analysis and scenario testing, efficiency enhancement, cost reduction in large-scale distribution and inventory control systems design, and facility layout planning. Being a mathematical modeling technique, simulation involves virtualizing real production systems to anticipate and analyze potential risks in production processes, understand current situations better, and make improvements to systems. In this study, using the factory simulation method, production systems at the seat production factory were simulated. The FlexSim simulation application was used to digitally model the current system's production processes. The simulation study aimed to better understand production processes, identify bottlenecks, evaluate error and risk scenarios, and make improvements to the processes.

**Keywords:** Simulation, FlexSim, Modeling, Industry 4.0, Digitization.

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# Product Recommendation in E-commerce Shopping with Product Image Similarities and Customer Basket Analysis

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## Abstract

In the first stage of this study, deep learning methods were aimed to be utilized to detect the visual similarities of the products used in e-commerce platforms. Deep learning is a powerful technology in the field of artificial intelligence, capable of analyzing complex data structures and revealing visual similarities by examining visual features of the products in detail. In this stage, deep learning algorithms were employed to thoroughly analyze the visual characteristics of the products and determine similarity criteria. Subsequently, using the identified similarity criteria and deep learning, the visual similarities between products were mathematically calculated, and similar products were identified.

In the second stage of the study, customer basket analysis was conducted to examine the shopping behaviors of customers. Customer basket analysis determines the relationships between the products added to the baskets based on customers' past shopping experiences. This analysis was used to provide personalized product recommendations to customers by evaluating the likelihood of products being purchased together in shopping baskets. Among the data analysis techniques used, customer basket analysis aims to better understand customers' shopping habits and predict their future purchasing behavior. The data obtained from these analyses were utilized to offer personalized product recommendations to customers.

In conclusion, this study represents an important step in providing personalized shopping experiences by detecting product visual similarities and conducting customer basket analysis in e-commerce platforms using deep learning methods. Effectively utilizing these methods can increase customer satisfaction and enhance the competitiveness of e-commerce platforms. Furthermore, offering product recommendations based on customers' past shopping habits when they cannot find the products they are looking for can improve customer satisfaction and increase sales. The findings of this study can serve as a valuable resource for the development and enhancement of e-commerce platforms and customer experiences.

**Keywords:** Customer basket analysis, visual similarity

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# Evaluatıon Of Phenomenon Selectıon Crıterıa In Phenomenon Marketıng Usıng Ahp: An Applıcatıon In The Cosmetıcs Industry

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## Abstract

With the increasing use of the internet, social media visibility is growing rapidly. Individuals discover and get to know many brands through social media communities. Popular individuals with a high number of followers and views on social media are called influencers. Influencers who are present on various platforms leverage their influence to market brands, products, or services to target audiences. This collaboration between brands and influencers is referred to as influencer marketing. Instagram is widely used as a social media tool for influencer marketing due to its popularity and large user base. Brands often promote and market their products through influencers on Instagram. A company that opts for influencer marketing needs to make an effective selection of influencers who can promote and market their products in the best possible way. This study focuses on influencer selection for product promotion. The selection of the right influencer requires the simultaneous evaluation of multiple and conflicting criteria. Specifically, this study evaluates the selection of the most suitable influencer for a company operating in the cosmetics industry, particularly in the production of makeup products. Fourteen criteria were identified for evaluation, and these criteria were weighted using the Analytic Hierarchy Process (AHP), a multi-criteria decision-making method. Upon examining the sub-criteria, it was determined that the two most important ones are the number of likes and the number of followers. The type of post and interaction sub-criteria were identified as having the lowest importance weights.
**Keywords:** AHP, influencer marketing, social media, advert, multi-criteria decision making.

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# Location problem of watch-towers used in early detection of forest fires: An application with AHP

*Zehra YAVUZ*[1]
*Gizem GENÇ*[2]
*Dilara ÇAMALAN*[3]
*Mehmet PINARBAŞI*[4]

## Abstract

This study will focus on the evaluation of the criteria affecting the location selection of watchtowers used to detect forest fires. Early detection of forest fires and rapid notification to extinguishing units contribute to controlling fires before they grow. To make effective early detection, an effective fire surveillance method must be used. Watchtowers are equipped with various cameras and are one of the most frequently used and effective methods for monitoring forests from certain angles and detecting fires. The information obtained from watchtowers is of great importance in determining the exact location of the fire, understanding the size of the fire, and deciding on the response method. In this respect, the location where the watchtower will be installed is also very important. In this study, the criteria affecting the determination of the location where watchtowers will be established are evaluated with the AHP method. The criteria are classified into three groups: geographical features, climate, and fire sources. These headings are divided into ten sub-criteria. These sub-criteria consist of slope, valley effect, tree density, high temperature, low humidity, wind, human load, power line, biological factors, and lightning criteria. As a result of the evaluations, it is seen that the human load criterion is determined as the criterion with the highest weight. The criterion that has the least impact on location selection is the low humidity criterion. In light of this information, this study will help to develop an effective watchtower site selection strategy for early detection of forest fires. The study makes an important contribution to the literature for the development of future watchtower installation projects.

**Keywords:** Forest Fire, Watch-Towers, Location Selection, AHP, Multi-Criteria Decision Making

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# Personnel Scheduling for Shift Balanced with Cable Car Personnel Demands

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*Tamer EREN*[4]

## Abstract

Nowadays, with the increasing population in cities, many alternative public transportation vehicles are used. Alternative transportation systems other than the bus and railway transportation network are planned, either integrated with transportation systems or separately. One of these transportation systems is the cable car. Although it is generally used for touristic purposes, it is sometimes used for passenger transfer and transportation in integration with other transportation systems. In passenger transportation, safety problems may arise as the cable car moves from a certain height via poles. Therefore, its maintenance and operation requires continuity. Since the maintenance and operation of the cable car is carried out by personnel, personnel scheduling problems arise. In this study, the shift scheduling problem for cable car line personnel is discussed. A balanced distribution of shift wages has requested, considering the wishes of the personnel. A goal programming model has been created to distribute personnel equally and balanced across shifts. When the solution results of the model are evaluated, it is seen that a significant balance is achieved in shifts. Thus, the shift wages expected by the staff have been distributed equally. Since there are very few optimization studies on cable cars in the literature, it is thought that this study will contribute to the literature.

**Keywords:** Cable car, Goal Programming, Personnel scheduling, Public transportation,

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# Increasıng Efficıency Through Lean Manufacturıng And Dıgıtalızatıon In The Automotıve Sector: A Strategıc Approach Wıth Ahp And Maırca Analysıs

*İrem DÜZDAR*[1]
*Deniz Feray SABA*[2]

## Abstract

Lean manufacturing and digitalization create a more competitive and sustainable production environment in the automotive industry. Lean manufacturing and digitalization are critical to creating more efficient, flexible, high-quality and innovative production processes in the automotive industry. These approaches help companies adapt to changing market conditions and gain competitive advantage. In this way, it reduces costs, increases quality and customer satisfaction, and minimizes environmental impacts.

Lean manufacturing and digitalization make it possible to make changes to the production line quickly and smoothly, making it easier to transition from mass production to custom production. Lean manufacturing and digital technologies encourage continuous improvement and innovation. This helps companies maintain their competitive advantage and grow sustainably.

It would be appropriate to examine in detail the potential advantages of the strategies determined as a result of these approaches to organizations and to combine these strategies effectively. An analytical evaluation of how the implemented strategies lead to measurable productivity increases is one of the objectives of this study. For this purpose, Analytical Hierarchy Process (AHP) and Multi-Attribute Ideal-Relative Closeness Analysis (MAIRCA) methods were used. The results of the study provide important instructions for organizations on how to objectively measure their performance by applying the determined strategies and strengthen their continuous improvement processes. This study aims to provide guidance in strategic management to organizations operating in the automotive industry, aims to offer new perspectives to academic researchers, and provides a practical framework for organizations that want to achieve sustainable success in the competitive environment of the future.

**Keywords:** lean production, digitalization, AHP, MAIRCA

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# Optimization of Tensile Strength via Mat Glass Fiber Characteristics by Using Response Surface Methodology

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## Abstract

Tensile strength is a very important performance characteristic of mat glass fiber which is used in many sectors especially for automotive industry. It is also important to be able to calculate the mathematical model to support the varying needs of the end users. It is the value where the breakaway status occurs by tension. In this study, optimization of the factors on tensile strength of mat glass fiber was studied. There are many factors which affect tensile strength of mat glass fiber. Mass per unit and loss on ignition were used as factors in this study. Response Surface Methodology is used to achieve the optimum tensile strength value of mat glass fiber. Minitab which is a widely used statistical analysis package was used for designing the experiments, modeling, analyzing and optimization. The mathematical relationships between the response (tensile strength (N)) and the factors (mass per unit ($g/m^2$) and loss on ignition (%)) are then determined by using regression modeling over the experimental data. The $R^2$ value for the model is calculated as 96.87% and the p-value=0.000 for the ANOVA which means the model is significant. Both of the characteristics were found as positively impressor factors on tensile strength of mat glass fiber while mass per unit characteristic is more effective on the response. Optimum factor levels for mass per unit and loss on ignition are calculated as 400 $g/m^2$ and 6%, respectively. For the optimized factor levels, 509.48 N is obtained for the maximum tensile strength. As a result, it is indicated that higher mass per unit and loss on ignition provide higher tensile strength for mat glass fiber.

**Keywords:** Tensile strength, mat glass fiber, design of experiment, response surface methodology, optimization

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# Optımısatıon Of Electrıcıty Storage In Wınd Power Plants

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## Abstract

Energy storage systems can be employed to enhance the utilization and efficiency of renewable resources, thereby reducing reliance on fossil fuels and contributing to environmental sustainability. Storage systems are essential for reducing energy costs and making energy use more economical, ensuring system stability, and making sustainability a permanent feature.

In this study, the electricity generation of a six-turbine wind power plant located in Izmir is estimated. Wind speed is used as the predictor variable. Nine distinct machine learning methodologies were employed for the wind generation forecasting model, and error metrics were calculated for these forecasts with real data for the period June 2023. The mean absolute percentage error (MAPE), root mean square error (RMSE), and R-squared values were compared as error metrics. Consequently, the most accurate forecast values were obtained with the catBoost regression method.

It is assumed that this power plant has a storage facility. The results of the literature review indicate that the most suitable storage method for the Turkish electricity market is pumped hydroelectric energy storage. A storage algorithm has been developed based on wind generation forecast and price forecast outputs. This algorithm minimizes costs in the electricity market and achieves price arbitrage by taking into account the hourly changing unit price of electricity (TL/MWh). The objective is to enable investors to use the storage systems they demand by providing profit optimization.

**Keywords:** storage, arbitrage, wind power plant, sustainability, machine learning

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# Evaluation of Customer Satisfaction with Data Mining Methods

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## Abstract

Today, businesses are developing various strategies to increase customer satisfaction and meet customer expectations. Customer satisfaction is of great importance for businesses to gain a competitive advantage and increase customer loyalty. Therefore, businesses are exploring various methods to evaluate and improve customer satisfaction. Data mining is a powerful analysis tool used to discover patterns, relationships, and information in large datasets. Data mining methods offer effective tools that businesses can use to evaluate customer satisfaction. These methods provide useful information for analyzing customer feedback, identifying factors affecting customer satisfaction, and developing customer service strategies for businesses. In this study, we analyzed customer complaints published on an online platform using multiple data mining methods to select the best classification method that can predict the class of future complaints. For this purpose, latent Dirichlet allocation (LDA) was applied to identify the most focused themes of customer complaints, and sentiment analysis methods were applied to determine sentiment values. Additionally, error source data obtained from the company's dealer error notifications were subjected to data merging processes with the analyzed LDA and sentiment analysis data. As a result, the attributes obtained from the comprehensive dataset were used for classification algorithms, and the accuracy and error rates of the models created were determined to select the best classification method. With this model, the aim is to predict the occurrence of future customer complaints.

**Keywords:** Data Mining, Machine Learning, Sentiment Analysis, Text Mining, Topic Modeling

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# Investigation of the Usability of Hydrogen Storage Materials in Supercapacitors

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## Abstract

Supercapacitors have attracted significant attention in recent years due to their unique ability to efficiently store and deliver energy, bridging the gap between conventional capacitors and batteries. With their high power density, fast charge-discharge capabilities and long cycle life, supercapacitors offer promising solutions for various energy storage applications. To optimize the performance of supercapacitors, extensive research has focused on the development of advanced electrode materials with improved electrochemical properties. In this study, four different lithium borohydride ($LiBH_4$)-CaO (or $Al_2O_3$, MgO, $SiO_2$) composites were prepared and electrodeposited on nickel foam. Cyclic voltammetry (CV) measurements were performed at scan rates of 20 – 200 mV/s in the voltage range of 0 – 1.5 V. Galvanostatic charge/discharge (GCD) analysis and stability measurements were performed for 2000 cycles at current densities ranging from 0.1 mA to 3 mA. Morphological features, elemental distributions and chemical composition were also focused. Especially, when the SEM images were analyzed, it was observed that the $LiBH_4$-CaO electrode was coated more homogeneously. As a result, the $LiBH_4$-CaO electrode remained at 80% in 2000 cycles.

**Keywords:** Supercapacitors, lithium-borohydride, metal oxides, hydrogen storage, composite electrodes**.**

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# Synthesis of pH-Responsive Poly(2-diethylaminoethyl methacrylate) Thin film by Plasma Enchanced Chemical Vapor Deposition

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## Abstract

The pH value of the environment can cause changes in the chemical and structural properties of pH-responsive polymers. They are used in various application areas including biosensors, controlled drug delivery, tissue engineering. Solution or vapor-based approaches are used in the synthesis of pH-responsive polymers. In solution-based methods, undesirable effects such as solvent damage to the substrate, surface tension effects and impurities may occur. Vapor-based methods have significant advantages in polymer production as they eliminate solvent-related problems. In this study, poly(2-diethylaminoethyl methacrylate) (PDEAEMA) were deposited as pH responsive polymeric thin films by as a vapor-based method, plasma enhanced chemical vapor deposition (PECVD). The chemical structures of the PDEAEMA films were revealed by Fourier transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS) analyses. In addition, kinetic studies were carried out to investigate the changes in the deposition rates of the PDEAEMA thin films at different substrate temperatures and plasma powers. The highest deposition rate (19.1 nm/min) was achieved at a substrate temperature of 10 °C and a plasma power of 60 W. In order to obtain more detailed findings on the deposition rates of the PDEAEMA thin film, the apparent activation energy was calculated. The activation energy of the PDEAEMA thin film was found to be -24.6 kj/mol, indicating that the adsorption rate is lower than the surface reaction rates. The contact angle measurements were carried out to investigate the pH-responsive performance of PDEAEMA. As expected, the films exhibited hydrophilic behavior after exposure to acidic solution and hydrophobic behavior after exposure to basic solutions.

**Keywords:** PECVD, thin film, pH-responsive

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# Investigation of the Usability of Natural Dyes in Paper Production: A Study on Color Change in Paper through Extraction of Coloring Agents from Cocoa Bean Shells

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## Abstract

Considering the environmental impacts and health risks of traditional chemical dyes, natural dyes are seen as an eco-friendly and human health-friendly alternative in the paper industry. This study explores the usability of natural dyes extracted from cocoa bean shells, a significant by-product, in paper production. Various solvents and extraction methods were employed, and the resulting colored solutions were applied to paper sheets to observe color changes. Different chemical additives were tested to improve the binding of dye substances to cellulose, and their effects on color retention were evaluated. Color measurements on the paper were conducted using the L&W Autoline 400 device, following the Tappi T 527–om 19 method. The measurements provided L*, a*, and b* values, indicating color lightness, red-green, and blue-yellow color changes, respectively. The Δ value, calculated from these parameters, measures the perceived difference between two colors, with higher Δ values indicating more distinct differences.

The most suitable extraction method for obtaining natural dye from cocoa bean shells was found to be water soxhlet extraction. The extracted dye was applied to the paper along with various chemicals such as epichlorohydrin-dimethylamine copolymer, polyvinyl amine, polyaluminum chloride, glyoxal and cationic polyacrylamide. Increasing the amount of natural dye, irrespective of the chemical type, led to higher Δ values. Except for glyoxal, increasing the amount of other chemicals also raised the Δ value. The highest Δ value of 37.37 was achieved using 61.75 g/L natural dye with 1.5% cationic polyacrylamide.

This preliminary study demonstrates the potential of natural dyes from cocoa bean shells as a sustainable alternative in the paper industry and aims to inform future research in this field.

**Keywords:** Cocoa bean shells, color extraction, natural dyes, paper production

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# Synthesis of Cobalt, Nickel, Copper Impregnated Al-pillared Clay Catalysts, Characterization Studies and Use of Pillared Clays in Catalytic Hydrolysis of Ethylenediaminebisborane

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## Abstract

Pillared clays are micro- mesoporous materials with significant potential for adsorption and catalytic applications. The pillarization process and appropriate metal loading into the pillared clays improves the porosity of natural clay minerals, increases catalytic activity, thermal stability and surface acidity. By using Hançılı White, HB bentonite clay, Aluminum-pillared clay (Al-PILC) was obtained with a base/metal ratio of 2.0. Cobalt, nickel, copper metals were inserted in the Al-PILC structure in single, double and triple combinations by wet impregnation method at different metal mass % /g Al-PILC and then calcined at 400 °C. Structural and catalytic properties of the synthesized catalysts were examined by FTIR, XPS, TGA, XRD analyses. FTIR analysis showed that the presence of Bronsted and Lewis acid centers was observed in pyridine adsorbed samples at room temperature. From pyridine desorption of the samples in the temperature range of 150-450ºC, a decrease in the peak intensities of the Bronsted and Lewis regions was observed with the increase in temperature. Metal oxide forms were determined from the orbital peaks of cobalt, nickel, copper and aluminum with XPS analysis. It was determined that metal loading on the Al-PILC structure increases thermal stability by TGA analysis. The least mass loss with increasing temperature was observed in the Al-PILC sample containing the triple combination of copper, cobalt and nickel. The d001 value of the Al-PILC sample was calculated as 1.83 nm from the XRD diffraction pattern. As expected, no change was observed in the interlayer distance value with the metal loading into the structure. The catalytic activities of the catalysts were carried out by studying the hydrolysis of ethylenediamine bisborane. It was observed that the catalytic activity of samples containing copper was better and the best results were obtained in samples containing copper-nickel.

**Keywords**: Co/Ni/Cu impregnated Al-pillared clay, structural properties, acidity, catalytic hydrolysis

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# Examination of Drying Characteristics of Tomatoes and System Performance in Heat Pump Dryer

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## Abstract

Drying is a method that has been used for many years to increase the water content of vegetables and fruits from 85-90% to 10-20%, to remove the water present in them and to prolong the shelf life of the vegetables and products. Another advantage of drying is the benefit in terms of packaging and storage due to the reduced volume of the dried product. In this study, cherry tomato slices (1/4) were dried in a heat pump dryer at 35, 40 and 45°C and 1.0 m/s air velocity. The drying rate was significantly influenced by drying temperature. To explain the drying characteristics of tomato slices, twelve thin-layer drying models were applied. Considering the high coefficient of determination ($R^2$), low chi-square ($\chi^2$) and root mean square error (RMSE) values, the Midilli & Kucuk model was found to be the best one. It was observed that the effective moisture diffusivity ($D_{eff}$) values were between $2.32\times10^{-10}$ and $3.99\times10^{-10}$ $m^2/s$. Using an Arrhenius-type equation, the activation energy value was calculated as 44.39 kJ/mol. When the energy analysis of the system was made, it was determined that the drying time was 357 minutes, total compressor energy consumption was 4.212 kWh, total energy consumption was 4.783 kWh, $COP_{sis}$ was 2.715, under the conditions of 1/4 slice thickness, 1.0 m/s air velocity and drying temperature 45°C. As a result, it was found that these were the most advantageous drying conditions in terms of energy consumption.

**Keywords:** Cherry tomato, drying, heat pump dryer, kinetic modelling, energy consumption

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# Self-Cleaning Coatings Based on the Boron Doped $WO_3$ Film for Solar Cells

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## Abstract

In the present study, it was aimed to prepare self-cleaning coatings for the solar cell. The main aim was to reduce the pollution-induced efficiency loss of the solar cell. In detail, boron doped $WO_3$ solutions were prepared and used to coat them as film on the glass substrates through the dip-coating method. $WO_3$ as a semiconductor photocatalyst can absorb the photons of the solar light, resulting in the formation of the photoexcited charge carriers. The photoinduced electron-hole pairs can form active radicals on the photocatalyst surface, providing the degradation of the organic pollution on the cover glass of the solar cell. The major drawback of $WO_3$ is the high recombination rate of its photoexcited charge carriers. To reduce the recombination rate of the photoexcited electron-hole pairs, $WO_3$ was doped with boron atoms. Doping $WO_3$ with boron atoms enhanced the photocatalytic activity. The self-cleaning mechanism was investigated through the photocatalytic dye degradation efficiency of the coated film samples on the glass substrates. Compare to the uncoated cover glass, there was a reduction in the light transmittance ratio and the solar cell efficiency of the boron doped $WO_3$ film. In addition, combining the boron doped $WO_3$ film with $SiO_2$ and ZnO improved the photocatalytic activity, and it increased both the light transmittance ratio and the solar cell efficiency compared to the boron doped $WO_3$ film. The composite film provided a photocatalytic dye removal efficiency of almost 92% after 240 min of the UVA light irradiation. Besides, the solar cell including the cover glass coated with the composite film provided slightly lower solar cell efficiency than the uncoated solar cell.

**Keywords:** Self-cleaning coatings, solar cell, photocatalytic activity, $WO_3$, boron doping

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# Convective Drying of Orange Slices in Cabinet Dryer

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## Abstract

In this experimental study, orange slices were dried by using a cabinet dryer. Experiments were carried out at three different drying air temperatures of 45 °C, 60 °C and 75 °C with the air velocity of 2.0 m/s. It was observed that drying characteristics of orange slices were greatly influenced by air temperature. As a result of the increase in drying temperature, the drying rate increased, and the drying times were shortened. Drying took place in the falling-rate period and constant-rate period was not beheld. Six commonly used mathematical models (Lewis, Henderson & Pabis, Page, Midilli & Kucuk, Wang & Singh and Vega & Lemus) were evaluated to predict the drying kinetics of orange slices. The fit quality of the proposed models was evaluated by using the determination of coefficient, reduced chi-square, and root means square error. Consequently, Midilli & Kucuk model was chosen the best model to explain the drying characteristics of the samples with all drying conditions. The values of effective moisture diffusivity were determined using Fick's diffusion second law and were found to be between $1.65\times10^{-10}$ and $7.04\times10^{-10}$ $m^2/s$. The activation energy values of the drying process were calculated by Arrhenius type equation and found to be 44.26 kj/mol.

**Keywords:** Convective drying, orange slices, mathematical modelling, effective moisture diffusivity, activation energy

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# Antibacterial Properties of Essential Oil-loaded Polymers

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## Abstract

Due to the immunity of microorganisms to antibiotics, efforts to develop different alternative solutions have gained popularity. In studies on this subject, alternative solutions of natural origin attract a lot of attention and essential oils are leading the way in this natural search. Approximately 3000 types of essential oils have been discovered and some of them are known to exhibit antibacterial properties thanks to the active ingredient in the essential oils. Essential oils are extracted from parts of the plant, such as wood, leaves and flowers, and there are many methods for their extraction. These methods include expression, fermentation and distillation. These parts of the plant used in the extraction of the essential oil make a difference in exhibiting antimicrobial properties. Many essential oils exhibit antimicrobial activity thanks to the hydroxyl groups in the phenol structure. These phenolic compounds cause disruption of the enzyme systems of microorganisms and kill microorganisms by disrupting cell structure. This activity of essential oils has led to popular studies in areas such as food, health and biomedical, with studies on its compatibility with polymers thanks to its natural antibacterial activity. These polymers can include a variety of polymers, primarily polylactic acid, chitosan, and polycaprolactone. By loading these essential oils into polymers at different ratios, it is aimed to show antimicrobial effects against various microorganisms. The addition of these essential oils obtained from nature to polymers used in human-oriented applications such as food, health and biomedicine to exhibit antibacterial performance is seen as a promising solution for the future.

**Keywords:** Essential oil, plant, polymer, antibacterial, microorganism

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# Investigation of the Effect of Changing the Melt Flow Index on the Mechanical Properties of the Film

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*Seda HAZER* [3]

## Abstract

Insulation tapes consist of a two-layer structure. These layers are neoprene rubber and the separating tape part that prevents the layers of neoprene rubber from sticking to each other. Neoprene rubber can be used in pipe coatings, insulation tape production and countless other applications where rubber is required to provide heat, sound and electrical insulation with its durability, chemical resistance and waterproof properties. The release agent of neoprene insulating tapes is made of polyethylene (PE), which is available in various forms such as high density and low density, or a blend of the two. By using these two films together, a strong combination is created to provide protection. Unlike PE films, a more rigid structure that allows less elongation and low elongation at break is expected from the separator part of the insulation tapes. For this reason, knowing the usage area of the release film to be produced is very important for the formulation. This study aims to develop a formulation for PE release film that is desired to be easy to break. For this purpose, firstly, films were formed by using three-layer blown extrusion technology by preparing coextruded low-density polyethylene (LDPE) and calcite/LDPE mixture in different ratios. For this purpose, polymer matrix composite films were produced by keeping the parameters determining all processing conditions constant. Tear strength and tensile-rupture strength tests were carried out for the characterization of the produced PE-based films. The lowest elongation value in the obtained films is 149%. Since the desired rupture value could not be obtained, high-density polyethylene (HDPE) blends with different melt flow index (MFI) were prepared with five-layer blown extrusion technology and their mechanical properties were investigated. In these blends, the elongation at the break of the separator part was obtained as 10%.

**Keywords:** Blown Extrusion, Tensile-Rupture Strength, Neoprene Insulation Tape

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# Performance of Epoxy System Used for Type IV Pressurized Composite Vessels in Different Curing Parameters

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## Abstract

High-pressure composite vessels have become prominent as a result of the widespread use of renewable energy sources. Composite vessels are classified into four standard categories: Type I, Type II, Type III, and Type IV. The most important difference between Type IV pressure composite vessels is that the liner material is a thermoplastic polymer. So, they offer up to 70% lighter weight than other types, corrosion resistance, a service life of up to 20 years, and low maintenance needs. In the automotive industry, Type IV vessels are preferred today for gas storage at 200 bar pressure in CNG-fueled vehicles and for CNG industrial gas transportation. Type IV high-pressure composite vessels are subjected to some tests as part of the ECE R-110 regulation. R-110 regulation in CNG storage and gas transportation has set the target glass transition temperature (Tg) for the resin at 110°C. In addition, Type IV high-pressure composite vessels are also subjected to accelerated stress rupture testing to determine resin performance. The test requires keeping both the inside of the Type IV liner and the outside of the composite vessel in 65°C hot water at 260 bar for 1000 hours. In this study, the glass transition temperature of the resin system used was determined under 5 different curing conditions: 85°C for 2 hours, 85°C for 4 hours, 85°C for 6 hours, 85°C for 8 hours, and 100°C for 2 hours + 120°C for 1 hour. In addition, by considering the optimum curing parameter determined, the effect of the Type IV high-pressure composite vessel on epoxy was observed as a result of being exposed to an accelerated stress rupture test. In this context, composite samples were kept in hot water at 65°C for 1000 hours, and composite mechanical properties were examined by interlaminar shear strength (ILSS) and split disk tests.

**Keywords:** Epoxy resin, High pressure composite vessel, Glass transition temperature, Composite mechanical properties, CNG storage and gas transportation.

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# Effect of nitrogen source and pyrolysis temperature on the doping of nitrogen on carbon black

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## Abstract

The performance of low-temperature fuel cells largely depends on the rate of the oxygen reduction reaction at the cathode. Nitrogen-doped carbons can provide oxygen reduction activity on their own and can also increase the activities of charged metal nanoparticles by affecting their surface properties. One of the important issues in the development of such catalysts is the development of a carbon structure that can provide a wide contact surface to the catalyst and doping its surface with nitrogen. In this study, melamine, urea and the mixture of these two were used as nitrogen precursors to obtain nitrogen-doped carbon black samples at different pyrolysis temperatures. Doping carbon black with nitrogen is a relatively rarely studied subject in the literature and is preferred due to the few processing steps involved in its preparation. For this purpose, the carbon black was first pretreated with nitric acid and then mixed with nitrogen precursors at specific ratios. Resultant materials were examined by X-ray photoelectron spectroscopy (XPS) analysis to find the doped nitrogen percentage and the state of nitrogen on the surface. According to the results, the highest doping rates were obtained at 600 °C, with the nitrogen content being respectively 2.49, 1.77 and 1.5 % for melamine, urea-melamine mixture and urea. After partial scanning it was found out that the surfaces of all the samples were rich with pyridinic and pyrrolic nitrogen atoms.

**Keywords:** Carbon black, nitrogen doping, oxygen reduction reaction, anion exchange fuel cell, metal catalysts

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# Production of Brassica nigra Nanoemulsion Formulation and In Vitro Evaluation of its Potential for the Treatment of Inflammation

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## Abstract

*Inflammation occurs as a physiological reaction to repair tissue damage caused by infectious agents, endogenous irritants, and environmental stimuli. Although there are different therapeutic modalities used, the use of phytotherapeutic agents in the treatment of inflammation, combining modern and traditional use, is more reliable than other medical treatments and has broad potential.*

*Brassica nigra* oil, known as black mustard, contains many phytotherapeutic components. The main ones are flavonoids, sinigrin, and terpenes, which have anti-inflammatory and analgesic activity as well as wound-healing properties. The low stability of medicinal plant-derived oils against environmental factors, toxic effects when applied directly and their hydrophobic nature limit their direct use. The formulation of oils from medicinal plants in the form of nanoemulsion dosage systems offers many advantages such as increasing the bioavailability of drugs, improving stability, providing controlled release, increasing biocompatibility, and increasing the interaction with tissue thanks to small droplets with larger surface area in nano size. It is an effective alternative among drug delivery systems.

Accelerated stability tests, physicochemical stability tests, and characterization studies were performed for all formulations. The pH results of the formulations were analyzed and found to be within the range suitable for topical application. Furthermore, active ingredient content analysis of the formulations was performed. After stability and characterization studies, it was determined that the most stable formulation was F4.MTT analysis was performed for the *in vitro* safety of this formulation and the non-toxic dose was determined. As a result, it was evaluated that the F4 formulation has the potential to be used topically in the inflammation treatment with its safe profile.

**Keywords:** Nanoemulsion (NE), Brasicca nigra (HY), In vitro cell culture, Controlled release system, *Inflammation*

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# Application of Microfluidic Technology in Antimicrobial Susceptibility Testing

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## Abstract

Antimicrobial resistance (AMR), defined as the resistance of microorganisms to the effects of antimicrobial drugs, is caused by the misuse and overuse of different antimicrobial agents in the healthcare and the agricultural industry; spontaneous evolution, mutation of bacteria and horizontal gene transfer of resistant genes. AMR is recognized as a growing global public health issue due to the emergence of multidrug-resistant microorganisms, causing difficult-to-treat infections. Antimicrobial susceptibility tests (ASTs) are used to detect and prevent AMR. Traditional ASTs include tests such as disc diffusion, dilution and gradient strip testing. However, new approaches are required to overcome the current limitations and improve the conventional methods. In recent years, microfluidic-based ASTs have come to the forefront due to their advantages and high potential. Microfluidic technology involves the design and manufacture of the systems which consist of micro-scale channels and chambers for the manipulation of fluids. For ASTs, microfluidic systems are utilized as a rapid and accurate approach to test the efficacy of different antibiotics against bacterial samples. The use of microfluidic systems contributes to the determination of the most effective treatment for a given infection and detecting the emergence of antibiotic-resistant bacteria. In addition, microfluidic-based ASTs can be integrated with other diagnostic tools, such as polymerase chain reaction (PCR), to gain more detailed information on bacterial population and antibiotic susceptibility.

**Keywords:** Antimicrobial resistance, antimicrobial susceptibility tests, microfluidic technology.

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# Obtaining, Characterization and Development of Nanoformulation of Wheat Germ Oil Using Supercritical Method

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*Yasemin BUDAMA KILINC*[3]

## Abstract

Free radicals break down collagen and elastin in the skin, causing an increase in wrinkles, sagging and fine lines on the skin. It causes early signs of aging on the skin. Wheat germ oil is very rich in antioxidants. Antioxidants help protect skin cells from damage caused by free radicals. The purpose of this study; Obtaining supercritical wheat germ oil (SWGO) from wheat germ by supercritical flow extraction method, synthesizing SWGO-loaded PLGA nanoparticles, conducting controlled release studies and examining the effectiveness of SWGO-loaded PLGA nanoparticles on delaying the signs of aging. Supercritical flow extraction method is the extraction method obtained by dissolving the oil and extract in the plants in the supercritical phase of CO2 under high pressure and temperature. To obtain oil from wheat germ, studies were carried out in a supercritical flow extraction machine at 90 bar 50°C, 150 bar 50°C, 230 bar 50°C and 250 bar 50°C. Through the experiments, the highest efficiency of 9.2% was achieved at 250 bar and 50°C. The total antioxidant capacity of the obtained SBRY was analyzed as 5335.28 µmol/100 g Trolox equivalent. In the external analysis sent to SWGO, the alpha-tocopherol content was determined as 1025.83 mg/kg. In the fatty acid composition analysis of SWGO, it was determined by GC (gas chromatography) device that 56% of the total fatty acids were linolenic acid and 15% were oleic acid. SWGO loaded PLGA nanoparticles were synthesized by the single emulsion (o/w) method and then subjected to lyophilization. Character analyzes of nanoparticles were carried out using Zeta-Sizer and UV Spectrophotometer. SWGO-loaded PLGA nanoparticles were determined to have an average nanoparticle size of 207.9 nm, a polydispersity index of 0.043 and a zeta potential value of -13.1 mV, and then controlled release studies were conducted. As a result, the encapsulation efficiency was calculated as 82.03% and the loading capacity was calculated as 74.6%, and it was determined that the nanoformulation was successfully achieved.

**Keywords:** supercritical extraction, wheat germ oil, nanoparticles, antioxidant, antiaging

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# Production And Characterization Of Symphytum Officinale Exosome Loaded Plga Nanoparticles For Use In Melanoma Treatment

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*Ozan Barış KÜRTÜR*[2]
*Yasemin BUDAMA-KILINÇ*[3]

## Abstract

Melanoma is a deadly type of skin cancer that develops from the uncontrolled growth of melanocytes and progresses by spreading throughout the body. Although melanoma has a lower incidence compared to other types of skin cancer, it has a high mortality rate. Surgical intervention, radiotherapy, chemotherapy, immunotherapy, and targeted therapies are commonly used in the treatment of melanoma. However, these methods have many side effects, including burning, wound healing issues, inflammation, and skin rashes. Therefore, it is crucial to research new approaches to treat this disease.
Plant-derived exosomes exhibit anti-cancer effects through various mechanisms, such as inducing apoptosis, inhibiting tumors, and promoting Caspase 9. Moreover, the minimal toxicity of these exosomes presents a promising approach for cancer treatment. However, exosomes have disadvantages such as aggregation and short life in circulation, which limits their clinical applications. In this context, encapsulating exosomes within nanoparticles is an approach used to combine the natural advantages of plant-derived exosomes with the stability-enhancing properties of nanoparticle technology.
*Symphytum officinale*, commonly known as comfrey, is a plant with anti-cancer, antioxidant, anti-inflammatory, and wound-healing properties. However, there is no research in the literature to investigate the anti-cancer efficacy of exosomes derived from this plant and their encapsulation within poly (lactic-co-glycolic acid) (PLGA) nanoparticles. In this respect, in our study, the properties of *Symphytum officinale* exosomes (SOE) such as size, concentration, and density distribution, were examined using nanoparticle tracking analysis (NTA). Subsequently, SOE-loaded PLGA nanoparticles were synthesized using the single emulsion method, and their average particle size, polydispersity index, zeta potential, and loading efficiency were determined. The results of the analyzes showed that SOE-loaded PLGA nanoparticles have appropriate particle size and surface charge distribution representing stability.

**Keywords:** Plant-derived exosomes (PDEN), *Symphytum officinale*, Controlled Release System, Nanoparticle, Anti-cancer.

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# Use of Gray Water Recovered From Biological Treatment in Industrial Process

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## Abstract

Our water resources are decreasing globally daily. Ensuring the rational use of our water and especially the recycling of wastewater are very strategic practices. In this regard, the recycling of domestic wastewater consumed, especially in large facilities, comes to the fore.

The aim of this study is to recycle the domestic wastewater consumed throughout the facility belonging to Istanbul Esenyurt Hoşdere Mercedes-Benz Türk A.Ş as a model facility and use it as the water needed by the bus factory. In this context, while determining the quality and quantity of water required by the facility, the concentrated wastewater from the filtering groups was aimed at being used in toilet and garden irrigation.

Within the scope of the study, domestic wastewater consumed throughout the facility, which has a 4-stage reinforced concrete biological treatment system built with the bardenpho method, was collected through sewage to the biological treatment facility. Gray water, produced from biological treatment and used in garden irrigation, has been strengthened with an advanced purification method, ensuring that it meets the water required by the industrial production process. Biological bardenpho purification system; membrane bioreactors, activated carbon, softening and reverse osmosis filtration groups were used. All analyses regarding the adaptation of the currently established facility to membrane bioreactors, the working mechanism of the filtering groups to be installed after the membrane bioreactor, and the necessary prerequisites for the availability and quality of water in production have been carried out. Finally, the suitability of reusing recycled water for irrigation of facility toilets and gardens was determined. Finally, the suitability of reusing recycled water for facility toilet and garden irrigation will be discussed.

**Keywords:** Waste water, bardenpho, membrane bioreactors, recycled water.

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# A Risk-Based Maintenance Framework Prioritization of Medical Devices

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## Abstract

In the ever-evolving landscape of modern healthcare, ensuring the reliable functioning of medical devices is paramount. These devices play a vital role in diagnosing illnesses, administering treatments, and monitoring patients' conditions. However, their effectiveness hinges on a well-defined maintenance strategy. Traditional, one-size-fits-all maintenance schedules often fall short, leading to either wasted resources on unnecessary procedures or neglecting critical components that could lead to catastrophic failures.

This project aims to develop a risk-based maintenance framework for medical devices, a systematic approach to prioritize maintenance based on potential consequences of failure.

It is concerning that a single medical device has more than one maintenance policy. Another aim of this project is to gather maintenance policies under one roof and ensure that every organization complies with this framework.

While establishing the framework, maintenance policies and the prominent and missing features of the maintenance policies were determined as a result of interviews with hospitals and medical device companies. In addition, the points that wanted to be improved during the interviews were also specifically mentioned. According to the results, FMEA analyzes were prepared for risk-based maintenance in medical devices.

While conducting FMEA analyses, attention was paid to the frequency of use of the selected devices, frequency of maintenance, lack of equivalents, expensiveness of their spare parts, their importance level and whether they were devices that had caused problems in the current period.

Although maintenance policies are basically similar, they differ from hospital to hospital and company to hospital. The reasons for this include budget differences, number of personnel, medical device types and protocol differences determined by the ministry and hospitals.

The result of this framework is to minimize the differences in maintenance policies, make it integrated into every medical device, hospital, and company, and provide a user-friendly environment.

**Keywords:** Risk-based maintenance, FMEA analysis, Standardized maintenance framework, User-friendly environment, Compliance, Enhanced patient safety

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# Isolation and Molecular Characterization of Pseudomonas sp. Pathogens and their Lytic Phages İsolated from Rainbow Trout Farms in Karkamış Dam Lake

*Oğuzhan KUZUCU*[1]
*Mikail ÖZCAN*[2]

## Abstract

In this study, isolation and molecular characterization of *Pseudomonas* sp. pathogen and isolation and morphological characterization of bacteriophage of this pathogen in rainbow trout farms in Karkamış Dam Lake were aimed. For this purpose, samples were taken from the liver, spleen, kidney and intestines of rainbow trout weighing 10-700 g from 35 different cages and 2 hatcheries. Tryptic Soy Agar (TSA), Nutrient Broth (NB), Brain Heart (Infusion) Agar (BHIA) were used for isolation of bacterial disease agents. These media were inoculated with fish samples and incubated in an incubator at 15-24 ºC for 24-72 hours. In addition to biochemical identification tests, Biolog System (The biolog GENIII micro plate) was applied to the pure strains and their phenotypic characteristics were analyzed. Genetic characteristics of the strains confirmed by Biolog System were analyzed. The 16s rDNA gene sequence analysis of the obtained bacterial samples was performed and the results were compared with reference bacteria in NCBI. The isolated *Pseudomonas* sp. bacteria were identified according to their biochemical, phenotypic and genotypic characteristics. Then, lytic phages of the identified *Pseudomonas* sp. bacteria were searched for in water samples taken from around the farm and bacteriophage isolation was performed by double layer agar cultivation method from the isolates whose presence was confirmed by spot test method. In the length measurements of the phages made by electron microscopy, the capsid length of the phage was measured as approximately 134 nm. In the classification according to morphological characteristics, it was determined that the phages were similar to Tectiriviridae and Cystoviridae families according to capsid size and morphology. DNA isolation of the isolated phage was also performed. Restriction enzymes were applied to the isolated DNA. After digestion with restriction enzymes, it was determined that the total base length of the phage's DNA was approximately 23.819 bp long.

**Keywords:** *Pseudomonas* sp., BIOLOG GEN III, Sequence, Bacteriophage, Electron microscope.

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# Waste PVC-based electrospun nanofiber scaffold containing ZnO nanoparticles: A multi-purpose and cytocompatible material

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*Zülfikar TEMOÇİN*[3]

## Abstract

The advancement of science and technology has expedited the quest for novel materials with exceptional characteristics. In recent times, researchers have been focusing on nanofibers due to their unique micro- and nano-structural features, which enable the creation of new materials. Nanofiber-based polymer materials have diverse uses in various disciplines, including air filtration systems, sensing devices, reinforcement composites, tissue engineering, energy storage systems, optics, medication delivery, wound dressings, catalysts, and water purification. The objective of this study was to create a versatile nanofiber material incorporating zinc oxide (ZnO) nanoparticles by the electrospinning technique, utilizing discarded polyvinyl chloride (PVC) plastic in an eco-friendly manner. The transportation of ZnO nanoparticles was facilitated using the polymer polyethylene oxide (PEO). Furthermore, the hydrophilic character of the PEO polymer will enhance the hydrophilic capabilities of the hydrophobic PVC nanofiber material, resulting in the formation of an amphiphilic material. The physico-chemical evaluation of the PVC/PEO-ZnO nanofiber material was conducted using scanning electron microscopy (SEM), Fourier transform infrared (FTIR), thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), and contact angle devices. Furthermore, the researchers examined the cytotoxicity of the electrospun PVC/PEO-ZnO composites in vitro using the MTT assay and the L929 fibroblast cell line. The results indicated that the PVC/PEO-ZnO nanofiber material was successfully synthesized and demonstrated no toxicity towards L929 fibroblast cells. The resulting composite material has great potential for versatile applications.

**Keywords:** Polyvinyl chloride, zinc oxide, waste plastic, nanofiber scaffold, nanoparticles, electrospinning, *in vitro* biocompatibility

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# Biomimetic Synthesis and Characterization of Calcium Phosphate Nanoparticles for Regenerative Medicine

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*Anika HOEPPEL*[2]
*Tobias WEIGEL*[3]
*Sofia DEMBSKI*[4]
*Mehmet Murat ÖZMEN*[5]

## Abstract

Calcium phosphate (CaP) is an important structural component of bone and teeth. Synthetic CaP implants are widely used in bone regeneration research due to their similarity to bone tissue. The challenge lies in the inability of synthetic CaP models to mimic the exact structure of the target bone tissue in which they are implanted, posing a biocompatibility issue. This limitation arises from the fact that synthetic CaP implants are already in their final form when they integrate with the host tissue, in contrast to the physiological healing process.

In this study, we sought to overcome this constraint by targeting a biomimetic synthesis of CaP nanoparticles (NPs). These NPs are naturally produced by extracellular vesicles (EVs) released from osteoblasts. EVs were isolated from osteoblasts by ultracentrifugation, both with and without polyethylene glycol (PEG), to assess PEG's impact. As a result of the characterization processes, EVs were shown to have average sizes of 215 nm and 240 nm in the presence and absence of PEG, respectively. The EV concentration was approximately 2 x $10^{10}$ and $10^{10}$ (particles/mL) with and without of PEG, respectively. To investigate the potential of EVs in the biomimetic production of CaP, vesicles were integrated into a collagen matrix to form a gel. The gels were examined using alizarin red staining to observe CaP formation and inductively coupled plasma mass spectrometry (ICP-MS) to calculate calcium and phosphorus concentrations. According to the results, it was observed that gels with EVs isolated without PEG produced more CaP compared to those when EVs isolated with PEG were used. The reason is thought to be that the interactions between EVs and collagen fibers are prevented by PEG residues. Thus, it was concluded that EVs isolated from osteoblasts without PEG have greater potential for biomimetic CaP production.

**Keywords:** biomimetic, calcium phosphate, extracellular vesicle, isolation, nanoparticles

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# Effect of Micro, Nano and Micro/Nano-particle Mixture Addition on Electrical, Optical and Mechanical Properties of Polyvinylidene Fluoride

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*Zeynep GÜVEN ÖZDEMİR* [2]

## Abstract

This research focuses on the synthesis and structural analysis of polyvinylidene fluoride/barium oxide (PVDF/BaO) composites filled with micro, nano, and micro/nano-reinforcing particle mixture. The research aims to determine the frequency-based electrical properties of the composites, such as complex permittivity and tangent loss, alongside with an investigation of their optical and mechanical characteristics. For this purpose, BaO nanoparticles (NPs) were synthesized via the co-precipitation method, and films were subsequently fabricated using the hot-press technique. The doping concentration of BaO ranged from 0.5 to 2.0 wt%. X-ray diffraction and Fourier Transform Infrared Spectroscopy methods were employed to analyze the PVDF matrix and BaO NPs. The analysis based on dielectric spectroscopy indicated that the addition of BaO micro, nano, and micro/nano-particles, up to 2 wt%, improved the energy storage capability of PVDF particularly at low frequencies. Moreover, the incorporation of BaO resulted in a decrease in ε" of PVDF, indicating enhanced electrical properties. The optical band gap, assessed via Tauc's plot, decreased with increasing BaO content, suggesting an enhancement in electric conductivity of the material. Mechanical testing, including tensile and hardness assessments, revealed that the elastic modulus and hardness of the material were enhanced with the addition of BaO particles, while elongation to fracture decreased.

**Keywords:** Polyvinylidene fluoride, barium oxide, dielectric spectroscopy, UV-Vis spectroscopy, mechanical durability

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# Determination of Mass Attenuation Coefficients of Aktaş, Çıldır Lake, and Kura River Waters for the Average γ-Ray Energy Released as a Result of 235U Fission

*Burcu AKÇA*[1]
*Rumeysa Günay AĞAOĞLU*[2]

## Abstract

In this study, elemental analyses of water samples taken from Aktaş, Çıldır Lake, and Kura River basins in Ardahan province were performed using ICP-MS. The mass attenuation coefficients were determined using the WinXCom program for the average γ-ray energy released due to $^{235}U$ Fission (7 MeV). The radiation interaction levels of these water basins in Ardahan province, which is close to the Metsamor Nuclear Power Plant (Armenia), were determined and aimed to raise awareness about the radiation damage and protection that this power plant may cause.

**Keywords:** Aktaş Lake, Çıldır Lake, Kura River, Radiation,$^{235}U$, WinXCom

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# Investigation of Topological Materials with First Principles Calculations

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*Kemal ÖZDOĞAN*[2]
*Savaş BERBER*[3]

## Abstract

Although only fifteen years have passed since their discovery, topological materials have played a huge role in technology and industry. It has received great demand from the world's leading universities, institutions and organizations in many fields such as logic gates of quantum computers, Josephson junctions of superconducting quantum interference devices, transistor designs that do not heat up, and thermoelectric materials. The topological properties of these materials can be theoretically predicted by DFT (density functional theory), and in the calculations made to date, it has often been shown experimentally that the materials predicted to be topological with the previous calculations are also topological.

In this study, Hall effects (Hall, Anormal Hall, Quantum Hall, Quantum Spin Hall, Anormal Quantum Hall) were examined and Topological Field Theory and Topological Band Theory, which are the theoretical foundations of topological materials, were mentioned. The fundamentals of DFT (Density Functional Theory) were mentioned, topological materials were classified and the $SmB_6$ compound, which is a topological Kondo semimetal, was specifically examined. The topological properties of $LaB_6$ and $SmB_6$ compounds were determined with the Quantum Espresso package program. The previously unstudied topological properties of these compounds, which have different stoichiometries among themselves, were examined theoretically. Possible application areas of these materials in technology and industry are also mentioned.

**Keywords:** Hall effect, topological, Quantum Espresso, Kondo semimetal, DFT

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# Electrochemical Analysis of PGE/PPy-Ni Oxide Electrodes to be Used in Supercapacitors

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## Abstract

PPy-Ni oxide was electrodeposited on a pencil graphite electrode (PGE). First, a PPy layer having 200 nm thickness was electropolymerized from a solution containing pyrrole monomer and $H_2SO_4$. Then, Ni-oxide was electrodeposited from a solution containing $Ni(NO_3)_2$. The mass of the Ni oxide was determined by changing the integrated charge density from 14 to 562 mC/cm$^2$. The capacitance behaviour of PGE/PPy-Ni oxide electrodes were studied by cyclic voltammetry (CV). The specific capacitance, power and energy density was calculated from these CV curves. The highest specific capacitance was found as 346.0 F/g at a scan rate of 30 mV/s for PGE/PPy-Ni oxide electrode in which the charge density of Ni oxide was 14 mC/cm$^2$ (Fig 1.(a)). Supercapacitor devices were fabricated with the electrodes in which Ni oxide was electrodeposited with the charge density of 14 and 70 mC/cm$^2$. The gel electrolyte between the electrodes consisted of PVA-$H_2SO_4$ and PVA-$H_3PO_4$. The electrochemical behaviour was investigated by EIS and CV. For the CV curves the potential range was extended from -0.3 to 0.6 V. The highest specific capacitance was found as 434.2 F/g for the PGE/PPy-Ni oxide (14 mC/cm$^2$)//PVA-$H_2SO_4$//PGE/PPy-Ni oxide (14 mC/cm$^2$) symmetric supercapacitor device (Fig 1.(b)). The supercapacitor devices made with two different gel electrolytes compared with each other. The near-ideal capacitance behaviour was obtained for the device where PVA-$H_2SO_4$ gel was used. It was also proved by EIS analyses, for this device the maximum phase angle detected in the Bode curve.

**Keywords:** PGE, Pyrrole, Ni oxide, Supercapacitors, Capacitance

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# Radon Gas Measurements in the Air and in Historical Fountain Waters of Fatih District, İstanbul

*Nurgül HAFIZOĞLU ALKAN*[1]

## Abstract

The most important contribution to the total natural radiation dose (2.4 mSv) that people are exposed to in the environment they live in comes from radon gas. This contribution is approximately 55% of natural radiation sources, and the annual effective dose contribution is around 1.3 mSv. Radon gas, which has no color, odor or taste, is released from soil and rocks and enters the water we drink and the air we breathe. Therefore, it is very important to determine radon concentrations in air, water and soil environments.

$^{222}$Rn concentrations in the air and historical tap water at 20 sampling points determined in the Fatih district of Istanbul were determined using the AlphaGUARD PQ2000 radon monitor at the Istanbul University Environmental Radioactivity Measurement and Research Laboratory. AlphaGUARD AquaKIT apparatus is included in the system for radon gas measurements in water samples. $^{222}$Rn activity concentrations measured in air and obtained by analyzing tap water will be presented in detail. These measurements were carried out within the scope of an ongoing project. The data presented includes a part of the study and is a preliminary study. No study has been conducted before to determine radon concentration levels in air and water in the Fatih district of Istanbul, taking into account meteorological conditions and geological structure. Radiological dose maps will also be created according to the radon levels to be determined in the study area. In addition, determining and evaluating the annual effective dose to which people living in the region and consuming historical tap water will be exposed will also make a significant contribution to the database.

**Keywords:** Natural Radioactivity, Historical Fountain, Radon

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# The Characterization of Structural Properties of NdFeB Magnet Powder

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*Öznur ÇAKIR*[2]

## Abstract

In recent times, magnetic materials have gained significant importance in the class of materials required in the healthcare sector, automotive industry, and many other fields. As a result, they have transitioned from being a rare material class with permanent and highly magnetic properties. Particularly, due to their magnetizable properties like rare earth elements, lanthanides, some non-metals, and metal alloys, they are preferred in areas requiring high performance. Among these materials that attract attention with their electrical, magnetic, and physical properties, sintered ferrite and NdFeB type magnets are the most commonly used. Sintered ferrites are ceramic-based magnetic materials and generally consist of complex oxides, while rare earth magnets are alloys made from rare earth elements. This study discusses the classification of magnetic materials and their magnetic behaviors and properties. Subsequently, it also touches upon the discovery history of the neodymium element to date, its electrical, magnetic, and physical properties, and its applications. The crystal structure of neodymium-based NdFeB magnet powders, along with their basic and morphological properties, has been investigated in conjunction with intriguing applications such as recycling and their impact on batteries. Laboratory devices such as XRD, SEM, ICPOES used during the research have allowed for a more detailed analysis of the microstructural and magnetic properties of materials. Through characterization experiments, it has been determined that additional elements and phase differences play a significant role in the magnetic properties of NdFeB magnets. These findings provide insights into the broad applications of magnetic materials, offering new perspectives for their utilization in technological advancements such as energy efficiency and the performance of electronic devices, thus laying an important foundation for future research.

**Keywords:** Magnetic materials, magnetization, NdFeB, electrical and magnetic properties, Neodymium

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# Quantum Mechanical Examination Of Alpha Decay And Programming Implementation

*Mehmet Emre BALAN*

## Abstract

This study aimed to code the decay probability formula derived from the explanation of alpha decay using the quantum tunneling principle, based on theoretical studies, using Python. By entering only the mass number, proton number, and disintegration values(Q), the radius of the main nucleus, inter-nuclear distance, Coulomb barrier, and decay probability resulting from many theoretical complex calculations can be displayed on the screen. Our motivation was to create a simple interface that would allow users to perform numerous complex operations within seconds by entering just three values for approximately 300 isotopes.

Previous theoretical studies were examined; the Schrödinger equation was analytically solved using quantum tunneling for the alpha particle, and the transmission coefficient (T) for the Coulomb barrier was calculated. Subsequently, a formula for decay probability was derived using T, and then this formula was coded using Python. The user can input the mass number, proton number, and Q value, and the operations are performed by the program within seconds.

The code was used to calculate the decay probabilities of various isotopes. The results are consistent with theoretical studies. Additionally, we tested the decay probabilities against nuclear half-lives, further confirming the consistency of our code.

Here, it was observed that Python is an effective tool for decay (α) probabilities. In the future, it is recommended to make the code more accessible to a wider user base and to verify it with experimental data. Additionally, considering the possibility of discovering new radioactive isotopes, a more comprehensive library could be developed for this code. When compared with different codes written in this field, we did not encounter a code like ours; although it is considered a new idea, its open-source nature and potential for further development are anticipated.

**Keywords**: Quantum tunelling, Schrödinger eguation, alpha decay, disintegration values(Q), Python

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# Metal Katkılı ∑3(111) tanecik sınırlı CdS yapının Elektronik ve Yapısal Özelliklerinin Yoğunluk Fonksiyonel Teori ile incelenmesi

*Can ALTUNDAŞ*[1]
*Murat ÇALIŞKAN*[2]

## Abstract

Cadmium Sulfide (CdS), a group I – VI semiconductor, has many potential applications in optoelectronic devices [1]. Due to its direct band gap of 2.42eV, volumetric CdS [2] is used in photocatalysis [3], photodetectors [5], quantum dot LEDs [6], thin film transistors (TFTs) [7], sensor applications [12]. ] is used. It is also used in color pigments due to its thermal and chemical stability [11]. Because it is an n-type semiconductor (due to the sulfur gap) [7], it is considered a suitable buffer layer for thin-film solar cell absorbers with CdTe, Cu(In, Ga)Se2 and Cu2ZnSn(S, Se)4[9,10]. is done [4]. Additionally, CdS offers minimal lattice mismatch in this type of thin-film solar cells. CdS crystallizes in three different structures: zinc blende (zb), wurtzite (wz) and rock salt (rs). Among these phases, zb-CdS is widely used in optoelectronic systems. As a result of thin-film CdS production, grain-bounded structures are formed. These grain-limited structures affect the performance of devices made with CdS. The most likely of these grain-bounded structures is the type described as ∑3(111). In this study, ∑3(111)CdS grain confined structure was examined with Density Functional Theory (GGA approach) and the effects of Ag and Cu dopant on structural and optical properties were examined.
**Keywords:** Cadmium Sulfide (CdS), Density Functional Theory (DFT), Thin Film Transistors

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# Investigation of Electromagnetic Form Factors of Exotic Mesons

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## Abstract

The discovery of more than 50 exotic hadrons within the last two decades is one of the most significant advancements in particle physics. While these exotic resonances have been observed in several experiments, and their physical properties such as masses, decay widths, quark contents, and quantum numbers have been determined, their structures are not very well understood. In this study, electromagnetic form factors of the exotic $Z_c(3900)$ meson are investigated using the three-point QCD sum rules method to gain insights into their structures. The $Z_c^{\pm}$ meson was initially observed by the BESIII experiment in the process $e^+e^- \rightarrow J/\psi\, \pi^+\pi^-$ in 2013. Additionally, its neutral partner was observed via the $e^+e^- \rightarrow J/\psi\, \pi^0\pi^0$ process in 2015 by the same experiment. Their quantum numbers are predicted to be $J^{PC}=1^{+-}$. Electromagnetic form factors of a meson describe how its electric charge and magnetic properties are distributed in space. They provide important information about the internal structure and dynamics of the meson, including its size, shape, and composition. In the case of an exotic meson like the $Z_c(3900)$, studying its electromagnetic form factors can help in understanding its unusual properties and behavior, which may differ from those of conventional mesons due to its non-standard quark content or other exotic characteristics. To compute the electromagnetic form factors of the $Z_c(3900)$ meson, three point QCD Sum Rules method is employed. Within QCD Sum Rules, a correlator function is expressed in terms of interpolating currents representing the meson of interest and computed in terms of quark, gluon, and hadronic degrees of freedoms. Perturbative and non-perturbative contributions to the correlator function in terms of quarks and gluons are calculated using operator product expansion techniques. Following techniques within QCD Sum Rules, matrix elements representing the electromagnetic form factors are analytically calculated, and their dependence on $q^2$ are calculated. is examined. These results will be instrumental in providing insights into the structure of the $Z_c(3900)$.

**Keywords:**
Exotic Mesons, Electromagnetic Form Factors, QCD Phenomenology, QCD Sum Rules, Tetraquarks.

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# Design of A Circularly Polarized Cross Dipole Antenna for S-Band Telemetry

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## Abstract

In satellite communicaitons S band is used for satellite telemetry applications. Circularly polarized antennas are essential part of this telemetry system. In general, they should be small, compact and simple enough for the integration into the airborne platform. . In literature, there are many examples of telemetry antennas in the form of patch, helix, turnstile and cross dipole antennas. Telemetry antennas must meet some technical specifications for the proper operation such as bandwidth (2.06-2.23GHz), impedance matching (S11<-10dB or VSWR <2), axial radio (AR<3dB), 3dB beamwidth (75°-85°), radiation pattern (directional, symmetric). In this study, we present design of a circulary polarized cross dipole antenna to be used in S-band satellite telemetry. The geometry of the antenna consists of 3 parts: cross-dipole, transmission line (feed) and reflector (ground plane). On cross-dipole part, an asymmetric cross-dipole method has been chosen to generate circular polarization. The arms of the cross dipole has been bent with angle ($\phi$) in order to tune axail ratio (AR) and radiation pattern.To feed the antenna a coax cable is with a movable structure in order tune the antenna. At the end of the coax cable, a microstrip tranmission line is designed for the excitation. Instead of simple uniform ground plane, a defected ground structure (DGS) has been employed. Proposed antenna has been modelled and simulated in the CST software tool and results which satify targeted technical specifications are presented.

**Keywords:** cross dipole, antenna, S-band, bandwidth, circular polarization, impedance matching, s-parameters, axial ratio, beamwidth, radiation pattern, reflector, satellite telemetry

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# High Q-factor Dual Resonance Visible Plasmonic Array

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*Erdem ASLAN*[4]

## Abstract

A high Q-factor design for a double resonant aperture-based plasmonic nanoantenna is presented. The thickness of the gold layers used as conductive layers in nanoantenna designs is inversely proportional to its spectral response in the range between 400 nm and 700 nm. As the thickness of the gold layers increases, the spectral response of the antenna in the visible region reduces the resonant peak amplitude. To overcome this issue, the thickness of the gold layers is decreased to as low as 5 nm. In this aperture-based nanoantenna design, magnesium fluoride is used as the separator layer with a thickness of 100 nm. The effects of dimensional changes in each parameter forming the nanoantenna geometry on the transmittance and reflectance peaks are observed. The behavior of the four-arrow shaped plasmonic nanoantenna is thoroughly analyzed using the Finite Difference Time Domain method to understand its optical properties and performance. A strong dual transmittance response is obtained at two wavelengths: 444 nm and 643 nm, corresponding closely to violet and red, respectively. Electric field intensity data from this design, simulated by near-field analysis, indicates the strongest points at which biological molecules can be detected. According to the simulation results, this nanoantenna's response may provide advantages for noninvasive detection applications.

**Keywords:** Q-factor Resonances, Dual-Band Nanoantenna, Plasmonic Detection.

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# Design and Implementation FPGA of System Using Field Oriented Control for Delta Connection Brushless Motor

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## Abstract

This paper presents FPGA(Field Programmable Gate Array) design and implementation method of system using FOC (Field Oriented Control) for delta connection BLDC (BrushLess Direct Current) motor. Brushless direct current motors are electro-mechanical units commonly used in daily life, industry, military and space applications. FOC method is used in applications that need constant torque of these motor types. FOC algorithm can use various PWM (Pulse With Modulation) methods while controlling BLDC motors. SPWM (Sinusoidal Pulse Width Modulation) is one of the most common methods for 3 phase inverter applications. FPGA's that provide timewise certainty, high reliability, high speed performance and process simultaneous operation are intelligent units useful for motor applications. In this work, it was used Mojo V3 development board that had an FPGA from Xilinx Spartan-6 family. Mojo V3 development board can be used easily because programmer connecting with usb to computer is provided on board. FPGA was designed and implemented by using VHDL language through design flexibility and robustness. While implemention of FPGA, UART module, Telemetry/Telecommand module, FOC calculation module, PID controller module, Speed calculation module, SPI (Serial Peripheral Interface) communication module, SPWM module are designed by VHDL. As the result of this work has been compared delta connection brushless motor and star connection brushless motor difference when FPGA implements FOC method.

**Keywords**: FPGA, motor control, BLDC, delta connection, FOC.

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# Seasonal Variation of Attenuation in Underwater Optical Communication Systems Due To Chlorophyll Concentration

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*Güneş YILMAZ* [3]

## Abstract

This research examines the impact of chlorophyll concentration on underwater optical communication systems through water samples collected from İskenderun Bay over four seasons. The study analyzes the effects of chlorophyll concentration, between wavelengths of 400 nm and 700 nm, on the absorption and scattering coefficients of water using mathematical model-based simulations. The findings indicate that the seasonal fluctuations in chlorophyll concentration, which vary as 0.7650 $\mu gL^{-1}$ in spring, 0.4225 $\mu gL^{-1}$ in summer, 0.3425 $\mu gL^{-1}$ in autumn, and 0.2525 $\mu gL^{-1}$ in winter, have a direct impact on the performance of underwater optical communication systems. It was determined that in spring, the increase in chlorophyll concentration due to heightened photosynthetic activity raises the absorption coefficient, negatively affecting optical power transmission. During winter, the decrease in photosynthetic activity lowers chlorophyll concentration, reducing both absorption and scattering coefficients, resulting in a decrease in attenuation of the light power emitted from the transmitter. The seasonal changes in chlorophyll concentration show that the output power reaching the receiver during winter experiences 18.75% less attenuation compared to autumn, 33.75% less attenuation compared to summer, and 87.5% less attenuation compared to spring. Therefore, integrating such ecological factors is essential to enhance the efficiency of underwater optical communication systems. The research results emphasize the importance of considering biological parameters like chlorophyll and environmental effects in the design and optimization of underwater communication technologies. In light of this information, the study underscores the importance of strategically evaluating the changing environmental conditions according to seasons in the design and operational strategies of underwater communication systems.

**Keywords:** Underwater wireless optical communication, underwater communication, chlorophyll concentration, seasonal attenuation, output power.

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# Applications of Differential Relays in Rail System Electrical Facilities: Enhancing Safety and System Performance

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*Recep YUMURTACI*[2]
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## Abstract

This study provides a detailed analysis of the components of medium voltage electrical systems used in urban rail systems (metro and tram), the faults encountered in these systems, and the protection mechanisms. The research specifically examines the critical functions of medium voltage elements in electrical systems and how these elements respond to faults. In this context, a detailed evaluation of the nature of faults and the various protection systems and relays used in response to these faults has been conducted.The protection systems used in electrical facilities are vital for system security. This review of the line differential protection system and relays addresses features such as selectivity, rapid intervention capacity, reliability, economic efficiency, and fault localization. The study includes field test results of a differential relay from a globally recognized brand, supporting the theoretical findings and confirming the effectiveness of differential protection systems.

Additionally, the paper examines the simulation of a metro line in the ETAP program and the evaluation process of these simulation results. This simulation serves as an important reference point in overcoming challenges and developing optimization strategies in the design and application of protection systems. The simulation results are shown to be consistent with practical applications as well as theoretical modeling, providing insights for significant corrections and improvements in system design.In conclusion, this paper aims to offer solutions to the challenges encountered in the protection and operation of medium voltage electrical facilities in rail systems. The research aims to provide a strong foundation for more in-depth studies in this field and offers recommendations for the broader acceptance and application of protection systems.

**Keywords**: Rail Systems, Medium Voltage, Protection Systems, Line Protection, Differential Relay.

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# Generating and Comparative Analysis of Image Hash Codes with Deep Reinforcement Learning

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## Abstract

Image hash codes are fixed size arrays that represent images. Hash codes are used for functions such as fast data search and data storage for large databases. They also provide advantages in security needs as they enable data to be processed efficiently and easily. In this study, it is aimed to produce hash codes for images by using reinforcement learning together with deep learning. Our approach treats hashing as a sequential decision-making process and differs from traditional hashing methods in this respect. One of the main components of our model is the deep learning network, which consists of a feature representation network to extract features of images and a policy network to convert images into binary codes. The other is the reward system used to create future decisions depending on the results of the decisions taken, in this way the quality of the hash codes produced by the model is evaluated. The policy network includes RNN (recurrent neural network) and Actor-Linear method. The reinforce algorithm was used to optimize the parameters of the policy network. The effectiveness of the approach in the study was observed on CIFAR10, NUS-WIDE and MIRFlickr datasets and compared with unsupervised methods such as LSH, SH, ITQ, SDH and current methods such as CNNH, NINH, DSH, HashNet. Average precision score (MAP) was used to comprehensively evaluate the algorithm success of the proposed approach and compared methods. According to the MAP scores for binary hash codes of different lengths, the proposed DRLIH gave the highest performance values with average MAP scores on the CIFAR10, NUS-WIDE and MIRFlickr dataset. The results obtained showed the effectiveness of the proposed approach.

**Keywords:** Image hashing, Reinforce algorithm, Recurrent Neural Network, VGG-19, Actor-critic

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# Design of a Titanium Nitride-Based Metasurface for 30 Degree Deflection at 1550 nm

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*Erdem ASLAN*[3]

## Abstract

Transition metal nitrides such as titanium nitride are materials that exhibit less optical loss due to their non-metallic nature, yet they can provide strong optical resonances due to their plasmonic characteristics. Titanium nitride-based nanoantennas designed in different geometries can also exhibit various electromagnetic phases. These properties make them suitable for use in metasurface designs serving applications such as focusing and beam splitting. In this context, the interface phase distribution required for a metasurface design capable of reflecting at 30 degrees in the direction of the incident plane at the operating wavelength of 1550 nm is determined. For this phase distribution, titanium nitride nanoantenna set with 18 different phase values in the range of 0-2π are numerically designed in various geometries. The dispersive dielectric permittivity data for titanium nitride nanoantennas are obtained from ellipsometric data of a titanium nitride film deposited at 800°C, using the Drude-Lorentz model. For numerical analysis, Finite Difference Time Domain Method is employed. The periodic arrangements of each antenna are individually analyzed, and the phase values created by these antennas are determined using field distribution monitors. For deflective metasurfaces, a specific interface phase distribution is present depending on the desired deflection angle. Each nanoantenna designed for efficient beam deflection must provide this phase distribution with the highest resolution. In this context, the aperiodic arrangement of these antennas on the interface is engineered taking into account the phase distribution of the relevant deflective metasurface.

**Keywords**: Transition metal nitrides, metasurface, beam deflection, linear phase distribution

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# The Effect of Variable Environmental and Traffic Conditions on LIDAR Sensor Performance: A Case Study with the CUPAC Dataset

*Recep EKEN* [1]
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*Güneş YILMAZ* [3]

## Abstract

This study investigates the sensitivity of LIDAR sensors under varying environmental conditions, analyzing data sets collected under different traffic, atmospheric, and road surface scenarios. Utilizing point cloud data from the CUPAC dataset, processed in Matlab R2021b, this research evaluates the impact of environmental factors on LIDAR performance, focusing on number of point clouds and intensity. Initial findings indicate significant variations in the invalid data rates and intensity values across different series, with the highest average invalid data rate observed in the Alpha2 series at 26.24% and the lowest in Delta3 at 16.74%. Notably, the highest average intensity recorded was 31.02 in the Delta3 series. These variations highlight the LIDAR sensors' responsiveness to different environmental conditions such as traffic density and physical obstructions. Further analyses of specific intensity fluctuations revealed a substantial decrease of 119.62% at a particular measurement point in the Alpha4 series, attributed to low-reflectivity objects, and an increase of 138.51% in the Delta2 series, linked to the vehicle passing between two white cars. These instances underscore the precision of LIDAR sensors in detecting subtle changes in environmental reflectivity. The comprehensive analysis underscores the capability of LIDAR systems to adapt to dynamic environmental variables, which is crucial for enhancing the reliability of autonomous driving technologies and other related applications. This study lays the groundwork for further research into optimizing sensor performance under diverse operational conditions, facilitating advancements in autonomous vehicle technology and environmental monitoring systems.

**Keywords:** LIDAR, point cloud data, autonomous vehicles, sensor performance.

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# L6-L7 Vehicles Low Voltage Harness Design

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## Abstract

The impact of the COVID-19 pandemic in 2019 led to significant shifts in people's behavior, particularly in transportation and mobility. Lockdown policies enforced worldwide encouraged the adoption of micro-mobility solutions for various purposes such as last-mile delivery, home office commuting, and car-sharing. These changes reflect a broader trend towards addressing emission and noise pollution concerns by promoting more environmentally friendly transportation options. One notable trend emerging from these circumstances is the modal shift in personal mobility, particularly from cars to lighter, smaller, and more specialized alternatives. Electric L-category Vehicles (such as electric scooters or small electric motorcycles) have gained prominence due to their suitability for average commuters. These vehicles are characterized by their compact size, lightweight design, and reduced energy requirements. As a result, they feature smaller batteries, which not only lower costs but also facilitate faster recharging times. By addressing these aspects comprehensively, this study aims to compile homologation and electrification requirements as well as harness calculations of electric L-category vehicles as viable alternatives for personal mobility. These vehicles not only offer environmental benefits but also align with the evolving preferences and behaviors of urban commuters seeking convenient, cost-effective, and sustainable transportation solutions.

**Keywords:** Light vehicles, micro-mobility, harness layout, electrification, homologation

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# Determination of The Viability of Microencapsulated Saccharomyces boulardii Yeast Added To Pomegranate Vinegar

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## Abstract

Considering lactose intolerance (65%), milk allergies and the increasing trend towards vegetarianism in the world population, interest in new non-dairy probiotic foods is increasing day by day. In this study, the survival of *Saccharomyces boulardii* CNCM I-745 (Reflor) probiotic yeast, whose reliability has been proven by EFSA (Europen Food Safety Authority), in free cell and encapsulated form with different polymers (alginate and chitosan) in pomegranate vinegar (3.66 pH) was investigated. Today, *S. boulardii* yeast is used in many countries as a preventive and therapeutic agent in the treatment of gastrointestinal disorders such as microbial and antibiotic induced diarrhea in children and adults. *S. boulardii* yeast has a very good resistance to body temperature of 37 °C, low pH, gastrointestinal enzymes, bile salts and organic acids, high viability and adheres well to the gastric wall. Due to these properties, this yeast has the potential to be used in fruity, fermented and acidic foods. As a result of the study, it was determined that the *S. boulardii* yeast added initially at a level of 7-8 log cfu/mL in all pomegranate vinegar samples could maintain its viability at a level of 6 log cfu/mL during 4 days of storage at 4±1ºC. When the first and last days of free cell and single (alginate) and double (alginate + chitosan) coating microencapsulated *S. boulardii* survival were evaluated, the values were 0.76, respectively; It decreased by 0.57 and 0.79 log cfu/mL. When looking at the effect of microencapsulation on viability, it was determined that single coating with alginate polymer preserved viability better than chitosan. It was determined that the pH value of pomegranate vinegar samples containing *S. boulardii* probiotic yeast was between 3.57-3.65 pH, the titratable acidity value was between 0.83-1.09 g/100g acetic acid, and the amount of water-soluble dry matter was between 1.1-1.3 Brix. The results obtained from this study will shed light on future studies on the use of *S. boulardii* yeast in acidic foods.

**Keywords:** *Saccharomyces boulardii*, Pomegranate vinegar, Probiotic, Microencapsulation, Functional food

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# Food Supplements Used in Pregnancy and Their Importance in Nutritional Physiology

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## Abstract

The deficiency of compounds that are essential for human health, especially in pregnancy, can cause significant health problems. In our research, folic acid, vitamin B12, iron, calcium, vitamin D and Omega-3 supplements, which are general supplements used in pregnancies in the natural process, except for special disorders seen in pregnancy, were discussed. As a result of the researches, it was found that the daily amount of folic acid before pregnancy and especially in the first trimester of pregnancy should be 400-600 mcg / day; Vitamin B12 4.5 mcg / day; iron 16-27 mcg / day; Calcium 950-100 mcg / day; Vitamin D 15 mcg / day; Omega-3 250-350 mcg / day. Inadequate intake of these vitamins and minerals during pregnancy and breastfeeding may cause significant negative consequences for the health of mother and baby. For example, studies have reported that folic acid deficiency leads to megaloblastic anaemia and neural tube defects in the foetus, B12 deficiency leads to accumulation of homocysteine and methylmalonic acid precursors, iron deficiency leads to significant anaemia, calcium deficiency leads to problems in bone development, vitamin D deficiency leads to infectious diseases, cardiovascular diseases, neurodegenerative diseases, some autoimmune diseases and omega-3 deficiency leads to problems especially in lipid profile. In pregnancy, it is often necessary to use supplements to meet the increasing physiological requirements due to differences in diet quality. In this study, the important effects of the supplements used on human health and the problems that may arise from the deficiency of these compounds and the necessary information about the food sources of these compounds are compiled and presented as a result of a detailed literature review. In addition, according to the results obtained in our study, the regular use of supplements in cases where the intake of these compounds is insufficient provides positive improvements in maternal and foetal health.

**Keywords:** Folic acid, vitamin B12, iron, calcium, vitamin D, omega-3

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# Preparation and Characterization of Carboxymethyl Cellulose Based Bigels Obtained from Sugar Beet Pulp

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## Abstract

Carboxymethyl cellulose (CMC) is a waste polymer with a hydrophilic structure, derived from cellulose, a leftover of the sugar production process. Gels are an alternative to palm oil because of their high gel qualities, which give the product viscoelastic features. The study's objective was to ascertain the gels' potential as an alternative oil substitute made from CMC. For this purpose, CMS-based hydrogels at 8%, 10% and 12% concentrations and 7.5% beeswax (BW) based sunflower oil oleogel were prepared at different ratios (H:O) (25H:75O, 50H:50O and 75H: 25O) and 9 bigels were created. It was observed that G' value was higher than G'' value in all samples throughout the entire frequency value. There was no change in response to the increase in frequency, indicating that a solid gel structure was formed. G' increased as the concentration of CMC hydrogel increased, and the oleogel were found to have a greater G' value than the hydrogel samples. The G' values of the bigels at 8–12% concentrated were shown to decrease as the hydrogel ratio increase. An increase in G' value was observed as the hydrogel ratio increased from 25 to 50 in bigel at 10% concentration, which was attributed to the synergistic effect between hydrogel and oleogels.

The dynamic rheological properties of all samples were compared using the Power Law model. Every sample had a K' value that was greater than a K'' value, indicating that the samples exhibited viscoelastic solid behavior. The solid nature of the sample becomes increasingly apparent and demonstrates that the samples exhibit viscoelastic solid feature as the n' and n'' values go closer to 0. Visual appearance of the bigel samples revealed that flow resistance created a gel structure by reverse inversion analysis. The hardness values of bigel samples increase with the increase of hydrogel concentration. According to the results of the rheology and texture analyses, bigels could be utilized as a substitute for palm oil.

**Keywords:** Carboxymethyl cellulose, wax oleogels and bigels, rheological properties, textural properties

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# Microbial Production and Characterization of Polyhydroxybutyrate (PHB)

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*Fatih TÖRNÜK*[3]

## Abstract

Today, it is crucial to produce biodegradable plastics in order to stop the harm that plastics derived from petroleum do to the environment. Polyhydroxyalkanoates (PHAs) are biodegradable intracellular polyesters that are produced by many bacteria as a carbon and energy source in the absence of essential nutrients such as oxygen, phosphorus, nitrogen, sulfur, which limit cellular growth, and in the presence of excess carbon source. Polyhydroxybutyrate (PHB) is the most prevalent kind of polyhydroxyalkanoate (PHA) within nature. Microorganisms accumulate PHB as granules inside the cell. The most common method used to obtain PHB polymer from microbial biomass is solvent extraction. *Pseudomonas putida* KT2440 (ATCC 47054) culture was used in fermentation studies and 20 g/L glucose was added to the basal medium composition as carbon source. The cell pellet obtained after centrifugation was dried in a lyophilizer and purified. Various extraction steps were applied to the dried pellet and the extracted PHB passed from liquid phase to crystalline phase. The FTIR spectra of the obtained PHB sample were measured using FTIR spectroscopy. In the spectrum of PHB, the C-O groups at about 1.282 $cm^{-1}$ were associated with the saturated ester bond, the absorption peaks at 1.382 and 1.448 $cm^{-1}$ were associated with methyl (-CH3) group, the peaks at 2.930, 1.727 and 3.429 $cm^{-1}$ were associated with methyl (-CH), -carbonyl (C=O) and hydroxyl (-OH) groups, respectively. The outcomes were discovered to be in line with those of comparable investigations. The use of bioplastics is becoming increasingly popular and therefore more in-depth research is required..

**Keywords:** polyhydroxybutyrate, microbial polymer, *Pseudomonas putida*, biodegradable polymer, food packaging

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# The İmportance of Psychobiotics in Athlete Performance

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## Abstract

Psychobiotics were first defined as a specific subclass of probiotics that alter the gut-brain axis, leading to mood, anxiety, and cognitive function changes. Probiotics, which contain beneficial, living microorganisms, are living organisms that positively affect health by regulating the intestinal microbial balance of humans. Probiotics play a crucial role in enhancing athlete performance by positively impacting various aspects such as fatigue, muscle pain, body composition, and cardiorespiratory fitness. They can improve exercise outcomes by modulating gut microbiota composition, promoting the clearance of exercise-related psychological fatigue, and regulating metabolic pathways. Psychobiotics play a crucial role in enhancing athlete performance by positively impacting their psychological well-being and physical health. By producing neurotransmitters, short-chain fatty acids, and anti-inflammatory cytokines, psychobiotics contribute to mood improvement, stress reduction, and enhanced cognitive function. Additionally, probiotic supplementation has been linked to increased antioxidant levels, improved mental health parameters, and enhanced immune activity in athletes, promoting overall well-being and performance. Moreover, probiotics aid in reducing the negative physiological effects of strenuous exercise, potentially improving muscle endurance, intestinal health, and immune system function. These live bacteria, such as *Lactobacillus* and *Bifidobacterium* strains, colonize the gut flora, reducing inflammation, cortisol levels, symptoms of depression and anxiety, and improving memory. Probiotics like *Lactobacillus casei Shirota* have been shown to decrease stress, and anxiety, and improve cognitive state among football players, indirectly enhancing athletic performance. Studies have demonstrated that probiotic supplementation can upregulate beneficial gut microbiota, inhibit harmful bacteria, and regulate metabolic pathways, leading to the clearance of exercise-related psychological fatigue in athletes. While some studies have shown probiotic supplementation to enhance aerobic performance and strength in athletes, the overall evidence is inconclusive, necessitating further well-controlled research to solidify the understanding of probiotics impact on athletic performance.

**Keywords**: Probiotics, psychobiotics, athletes, athletic performance.

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# Use of Apricot Kernels in Plant-Based Milk Production

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## Abstract

Recently, the demand for plant-based milk (PBM) alternatives have been increased due to especially lactose intolerance and protein allergies, as well as different lifestyles including vegetarian and vegan diets. In this research, the use of apricot kernel in plant based milk production was investigated. For this purpose, apricot seeds obtained from a local fruit juice production facility were ground after various pre-treatments and kept in water to obtain a milk-like extract. Apricot kernel milk is produced from cleaned whole apricot kernels through grinding, soaking in water (1:1.5 S:W ratio, at 50°C for 1 h), enzyme addition, filtering, homogenization, filtration and pasteurization (at 85°C for 15 sec.) process steps. Some chemical analyzes (Bx, protein, CHO, total fat and ash content) and hunter color values were measured in the obtained apricot seed milk, and the obtained data were compared chemically with industrial cow milk. According to the results, it was determined that apricot kernel milk had higher values than cow's milk in terms of protein and CHO contents, but was lower in terms of total fat content. It has been determined that the energy value of 100 ml of apricot seed milk is approximately 10% higher than cow's milk. According to Hunter color evaluation, as an average *L* (71,80) *a* (4,01) and *b* (13,22) values of apricot seed milk samples show that a darker colored product is obtained compared to the color values of cow milk (*L*: 91,94; *a*: 0,83; *b*: 11,07). As a results, apricot kernel milk production has contributed to obtaining various findings in the field of engineering. These effects have yielded data that will contribute to development in areas such as increasing product quality, ensuring efficiency and safety, optimizing costs and improving product development processes.

**Keywords:** Apricot, Kernel, Plant Based Milk, Extraction

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# Non-thermal Treatments Applied to Plant-based Milk Substitutes

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## Abstract

Plant-based milk is rapidly advancing into the new product category as many consumers are shifting their dietary habits towards consuming more plant-based foods such as plant milk analogs (PMA) for health, sustainability, and well-being. Non-thermal technologies such as high-intensity ultrasound (US), high-pressure processing (HPH, UHPH), pulsed electric field (PEF), supercritical carbon dioxide (SC-CO2), ultraviolet radiation (UV-C), microfluidization, microfiltration are being investigated as potential alternatives for plant-based milk production. The mechanism of action of ultrasound application is explained by acoustic cavitation, including the formation and collapse of air bubbles. By using ultrasound, particle size reduction and protein modification are achieved in plant milk. The effect of high-pressure homogenization occurs depending on the applied pressure level. The benefits of high-pressure homogenization can be listed as follows: increasing the bioavailability and dispersibility of bioactive lipids, increasing membrane permeability and disrupting cell functions, causing cell explosion and inactivation of microorganisms, and ensuring the stability of the emulsion by enabling proteins to form layers on macromolecules. Plant-based milk passed through a microfluidizer is directed to an impact block through microchannels, ensuring that the mixture to be emulsified has a smaller particle size. In the application of pulsed electric field, the plant milk is placed between two electrodes and subjected to short pulses at very high voltage and minimum processing time (compared to heat treatment), which is incredibly effective in reducing the particle size and increasing the stability of colloids. Microfiltration mechanically separates plant milk from large particles or various microorganisms such as bacteria by separating macromolecules, colloids, or suspended solids. In ultraviolet sterilization (UV-C), microorganisms in plant milks can be quickly and efficiently inactivated or killed using UV-C radiation with a wavelength of 200 to 280 nm. Ozone (O3) application is a non-thermal process that neutralizes microorganisms. As a result, non-thermal processes are applied for a wide range of purposes, from ensuring the stability of plant milk to microbial inactivation.

**Keywords:** Non-thermal processing, plan-based milk, stability, ultrasound, high-pressure homogenization

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# Design and Optimisation of Nanomaterials with Artificial Intelligence

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## Abstract

This study focuses on the design and optimisation of nanomaterials using artificial intelligence and deep learning techniques as well as traditional materials science methods. Nanomaterials are materials produced by nanotechnology and generally have dimensions in the nanometre range. With the advancement of nanotechnology, nanoscale products are spreading from electronics to healthcare products and pharmaceuticals, initiating a radical change in the world order. The properties of these materials are determined by many factors, ranging from their chemical composition to their crystal structure and surface morphology. These properties are critical in determining the performance of materials. Traditionally, the design and synthesis of nanomaterials has been carried out through experimental studies. However, this process is quite time-consuming and costly. With the introduction of artificial intelligence and deep learning techniques, this process can be made more efficient. Artificial intelligence and deep learning algorithms can identify complex relationships and recognise patterns based on large amounts of data. This enables them to analyse and optimise the relationships between nanomaterial properties and synthesis conditions. This area of research has great potential in materials science and can play an important role in the discovery and design of next-generation materials. It can also contribute to the dissemination of nanomaterials to a wider range of applications, enabling the emergence of innovative solutions in many fields, from electronics to biomedicine. To this end, the results of previous studies have been evaluated, analysing the advantages of these techniques and the shortcomings of existing methods.

**Keywords:** Nanomaterials, Nanotechnology, Artificial Intelligence, Deep Learning

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# The Effect of Thermal Oxidation on the Selective Leaching of LiFePO4 Cathode Materials

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*Daniel REYES MARTINEZ*[3]
*Alexandros CHARITOS*[4]

## Abstract

Oxidative thermal pre-treatment offers a promising method for selectively leaching lithium from $LiFePO_4$ (LFP) cathode materials. In this study, cathode materials obtained from manually dismantled commercial cylindrical LFP cells were thermally oxidized in a muffle furnace at 650°C with and without the addition of air to remove the binder, dry electrolyte, and oxidize LFP cathode materials. It was then possible, utilizing a 0.5 M sulfuric acid concentration to recover 100% of lithium while limiting the iron leaching yield to about 53% at room temperature within 1 h. This approach minimizes reagent usage and system complexity, relative to the state-of-the-art selective lithium leaching using $H_2O_2$, aligning with the principles of green chemistry. This is due to pre-oxidation of $Fe^{+2}$ to $Fe^{+3}$ during thermal treatment. Acid concentration between 0.1-0.5 M, liquid/solid ratio (20-120 mL/g), reaction temperature (25, 50 °C), and time (1-5 hours) were tested for process optimization. Statistical analysis allowed to determine that increased acid concentration, liquid-solid ratio and temperature positively influence lithium leaching, while higher reaction time yields low Li recoveries, with similar trends observed for Fe leaching. The dataset obtained sets a precedent for a simulation-based Life Cycle Assessment (LCA) comparison between the traditional selective leaching with $H_2O_2$ and the proposed method using oxidative thermal pretreatment to evaluate the difference in their environmental footprints.

**Keywords:** LiFePO4, battery recycling, oxidative thermal treatment, leaching, lithium recovery

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# Static Magnetic Properties and Microstructural Differences in CoCuFeNi High Entropy Alloys Synthesized via Mechanical Alloying and Ultrasonic Spray Pyrolysis

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## Abstract

High entropy alloys (HEAs) are a novel class of materials that consist of multiple principal elements, which may result in exceptional mechanical, chemical, and physical properties suitable for a range of applications. Among these, the CoCuFeNi composition has attracted significant attention due to its unexpected and unique characteristics. This study focuses on synthesizing CoCuFeNi HEAs using two different methods: Mechanical Alloying (MA) and Hydrogen Reduction assisted Ultrasonic Spray Pyrolysis (USP-HR), to explore how synthesis techniques influence the morphology and magnetic properties. The HEAs particles were synthesized and then analyzed using X-ray diffraction, scanning electron microscopy (SEM), and vibrating sample magnetometry (VSM) to evaluate the structural and magnetic features of the produced particles. The SEM analyses revealed distinct morphological differences; particles produced via USP-HR were spherical, whereas those from MA exhibited more complex and irregular shapes. Magnetic characterization showed that the USP-HR method yielded particles with a higher saturation magnetization (Ms) of 108 emu/g and a coercive field (Hc) of 21.55 Oe. In contrast, particles produced by MA displayed a lower Ms of 90.22 emu/g and a coercive field of 8.53 Oe. These results underline the significant impact of the synthesis technique on the physical and magnetic properties of CoCuFeNi HEAs. This study demonstrates that the choice of synthesis method not only affects the morphological characteristics but also significantly influences the magnetic properties of HEAs.

**Keywords:** High Entropy Alloys, Mechanical Alloying, Ultrasonic Spray Pyrolysis

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# Material Tests Carried Out During Interior Product Development At Tofas Interior Design Administration

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## Abstract

Material testing is one of the indispensable requirements for every component developed in the automotive industry. Because before a product is put into use, it must have the durability to cope with possible situations that the vehicle may encounter throughout its life. These situations are simulated in the cabins where the tests will be carried out. Difficult situations that the product may be exposed to for years are compressed into days in these cabins. In this way, the status of the product to be developed is analyzed as a result of the conditions. Of course, first you need to look at which part of the vehicle the product was developed for. Because each vehicle region has different norms, test conditions and requirements compared to others.In this study, the testing processes of the part developed for use in the series under the umbrella of Tofaş and for use in the interior instrument panel area are discussed. It was investigated what tests were subjected to mass production, what was the condition of the product during these test processes, and what changes were made to ensure that the product could pass the tests it could not pass. The main parameters in the tests can be summarized as temperature, humidity, light, time, chemical resistance and cycles. Temperature is perhaps the most important parameter here. Since the developed product is located on the vehicle control panel, it will be exposed to direct sunlight throughout its lifetime. It would be much wiser to learn the answer to the question of what happens if the product is left under the sun for a long time. Such situations need to be clarified before customer use. Tests are actually the final rehearsal of the product before customer use. For this reason, it is indispensable in the sector. Because possible errors need to be noticed before the customer.

**Keywords**: thermal cycle, chemical resistance, humudity, xenon fading, norm, condition

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# Investigation of the Effect of Different Sanding Combinations and Line Speed on AISI 304 Quality Stainless Steel Surface Roughness in the Polishing Process

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## Abstract

Stainless steels have become indispensable for the needs that standard steels cannot meet in the industry with their high forming capabilities, corrosion resistance and impact damping properties. The most common use of stainless steels in industry is flat products. Machinery, automotive, food, chemical and aerospace sectors are the areas where stainless steels are most preferred. AISI 304 grade stainless steels from the austenitic stainless steels group are also one of the most preferred grades. Relatively affordable prices, meeting the desired corrosion resistance, and not having a ductile brittle transition temperature value due to their austenitic structure are among the most preferred reasons for their preference. The production of stainless steels is generally followed by melting, casting, hot rolling and cold rolling processes respectively. In the industry, finishing processes are applied to stainless steels according to their intended use. Satin finishing, sanding, brushing, mirror surface polishing are some of them. Kitchen equipment, food processing equipment, interior and exterior applications, architectural applications, furniture and elevator applications are some of the areas of use after finishing.

In this study, the surface roughness of AISI 304 stainless steel coil, which is in the austenitic stainless steels group, was measured perpendicular and parallel to the rolling direction with a surface roughness measuring device after sanding in different combinations on the roll-to-roll sanding line. With the measurement results, the effects of abrasive grit size, grit type and line speed on material surface roughness were analyzed. In the study, parameters were selected to obtain surfaces that meet customer demands and expectations in accordance with the standards.

**Keywords:** Stainless Steel, AISI 304, Surface Roughness, Sanding Process, Tribology

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# Evaluation of the Use of Different Type of Aluminum Alloys as a Composite Pressure Vessel Boss Material with Different Molding Techniques

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## Abstract

Aluminum alloys are frequently used in pressure composite wrapped vessels and automotive applications due to their advantages such as lightness, moisture resistance and recyclability compared to other metals. One of the biggest advantages of Type IV pressure composite vessels is the use of a much lighter thermoplastic liner instead of metal. However, this liner should have a metal nozzle called "boss" in connection with the thermoplastic part to let the gas inlet and outlet. Considering the lightness, cost-effectiveness and ease of processing, aluminum alloys are preferred for this application. One of the most common methods used in thermoplastic liner production is rotational molding technology. Compared to other liner production methods, rotational molding allows the liner to be produced in one piece without the defects caused by the welding processes used to join the metal boss and liner. Besides, the mechanical properties of the aluminum part used in the liner must be suitable for the high pressure operating conditions of the Type IV pressure composite vessels. In this study, the behavior of different aluminum alloys under rotational molding process conditions was investigated. The mechanical properties changes of Aluminium 2024 T3, 6082 T6 and 7075 T6511 alloys were determined, which were exposed to process temperatures up to 300°C for at least 30 minutes. According to the results obtained; The change in the strength of 2024 alloy, which was kept at 300°C for 30 minutes, is under 10%, while 6082 is 54% and 7075 is 57%. Contrary to this situation, when a special molding technique is used to lower the process temperature; It was determined that all alloy types exposed to 200°C temperature conditions, not observed any change over 10% in both of their yield and tensile strength.
**Keywords:** Aluminum, Rotational Molding, Composite Pressure Vessel (COPV), Mechanical Properties, Process conditions.

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# Calculatıon And Desıgn Evaluatıon Of Steel Constructıons By Fınıte Element Method

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*ENES DEMİRHAN*[2]

## Abstract

Design studies of steel structures, which are widely used today, are very important. Structural analysis of these structures according to their usage areas varies according to the usage areas of the structures. Finite element method is used in the analysis of these structures. One of the finite element programs, ANSYS program, will be used to analyze these structures and evaluate the design studies and evaluate the results. At the beginning of steel structures, structures such as steel bridges, pressure vessels, which are used continuously today, are used. The general process of calculating the analysis of these structures is very important to use the real life values on the program. The structural analyzes to be made must be in accordance with reality. Shell modeling is used in these structures. Shell method is used in shell modeling. This modeling method is the method that gives the most accurate results close to reality in the finite element method. All of these structures are structures prepared in accordance with ISO standards. The profiles used in the structures are profiles and plates that are widely used in the field. The S-N diagram (wöhler curve) of each material used in steel structures is very important. The modulus of elasticity of the material should be selected according to the place and conditions to be used and used in steel structures. The selection of each material according to the design is very important in this process. The one of the main factors that will directly affect the structural analysis. Material selection is of serious importance in finite element method. In the analyzes, it is necessary to determine the connection types to the structure to be formed according to the place of use. Accordingly, it ensures that the parameters to be used in the finite element method affect the analysis. Design evaluation will be realized by considering the issues to be considered in structural analysis.

**Keywords:** Ansys,Finite Elements, Steel Constructions

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# Simulation and Analysis of Seat Vibrations Dependent on Road Profile

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## Abstract

This study aims to simulate and analyze seat vibrations depending on road profiles using a half-vehicle model with integrated seat parameters of a specific Ford Transit model in Simulink. Particularly, the impact of road surface characteristics characterized by vibrations such as speed bumps on the vehicle seats and thus on the passengers is significant. This study aims to investigate these effects through a simulation model implemented using MATLAB Simulink. The study begins with a literature review identifying vibrations and their effects on human health. MATLAB Simulink's usage is briefly explained. Subsequently, a half-vehicle model is created in the Simulink environment, and seat vibrations are simulated with inputs of road profiles such as asphalt road, very rough road, rough road, and speed bumps. This simulation aims to examine how seat vibrations change under different road profiles and how this affects passenger comfort. The results obtained clearly demonstrate the effects of various road profiles on seat vibrations and thus on passenger comfort. Additionally, this analysis highlights important factors that should be considered in the design of the vehicle's suspension system and road surface improvements. The study discusses how road profiles affect seat vibrations and thus passenger comfort. The aim of the study is to deeply understand the variability of seat vibrations depending on road profiles. Therefore, this study aims to contribute to research in vehicle design and road safety by providing simulation and analysis of seat vibrations depending on road profiles.

**Keywords:** Half vehicle with seat addition, Simulink, Vibration Analysis, Road Profile, Drive Comfort

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# Piezoelectric Disk-Based Vibration Energy Harvesting: Design, Experimentation, and Simulation

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## Abstract

In this study, a circuit was designed to convert the vibration energy of piezoelectric disks into electrical energy, and the performance of this circuit was evaluated experimentally. Calculations were made to determine the amount of electricity that could be generated through vibration energy conversion at different positions of the disks. These calculations revealed that certain positions allowed for greater electricity production, thus providing a guide for the placement and optimization of energy harvesting systems. Initially, the amount of electricity that piezoelectric disks could generate under a certain pressure was calculated, and based on these values, an energy harvesting circuit was constructed. The usage of this circuit relies on generating energy through footsteps by placing it in areas where people walk intensively. The number of steps taken and the amount of energy produced were recorded through a circuit established with an Arduino board. Subsequently, the piezoelectric disks were vibrated for a certain period using a vibration motor, and the generated energy was recorded. The frequency of these vibrations was measured using a tachometer. Afterwards, an energy harvesting circuit with piezoelectric elements was simulated in MATLAB Simulink. The simulated piezoelectric circuit was vibrated for a certain period with the amplitude and frequency of the vibration motor. The results of the experimentally obtained data were compared with the simulation results to determine the amount of electrical energy produced during the conversion of vibrations generated by the vibration motor into electrical energy by the piezoelectric disks. This study presents an innovative approach to the design and performance verification of circuits that convert the vibration energy of piezoelectric disks into electrical energy, making significant contributions to alternative energy sources. The project contributes valuable insights to the development and optimization of energy harvesting systems.

**Keywords:** Piezoelectric Discs, Simulink, Energy Harvesting Circuit, Electricity Generation

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# Research and Electronic Circuit Installation of Sensors for Force Measurement

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## Abstract

Force measurement plays a critical role in industrial applications. In this study, research was done about force sensors, and a system was established for measuring forces in various processes in industry. Two types of sensors were evaluated: the Force Sensitive Resistor (FSR) and the strain gauge. The goal was to identify the most stable and accurate sensor circuit for precise force measurement. FSR sensor was created with a Wheatstone bridge circuit. Because Wheatstone bridge circuits provide more sensitive measurements. The FSR sensor has high resistance without load. Various forces were applied, and output voltages were measured. On the other hand, the strain gauge sensor, with a resistance of 120 ohms, exhibits small resistance changes under tensile and compressive forces. Strain gauge was integrated into a Wheatstone bridge circuit for precision, with the output amplified using the INA128 instrumentation amplifier, known for its adjustable gain, low noise, and high sensitivity. The voltage values obtained in the FSR sensor circuit are nonlinear. The strain gauge, when used with the Wheatstone bridge and INA128, provided more stable and accurate measurements. The amplified output was easier to interpret, making it more suitable for precise force measurement applications. The system output was measured 852 mV when there was no load on the sensor, decreased to 849 mV with a load of 300 grams, and further decreased to 837 mV with a load of 1494 grams. When measurements were repeated at different times, the same results were obtained. The study concluded that the strain gauge system, enhanced with the INA128 amplifier, outperformed the FSR sensor in terms of stability and accuracy. The FSR sensor is suitable for detecting the presence or change of force but not for precise measurements. Thus, for applications requiring precise force measurements, the strain gauge system is recommended.

**Keywords:** Force Measurement, Circuit, Sensors, Amplifier, Wheatstone Bridge

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# Color Based Object Sorting Automation

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## Abstract

Color Based Object Sorting Automation aims to prototype a system that is widely used in industry. Color Based Object Sorting Automation is an automation system that aims to quickly sort objects and glass products of different colors. The main purpose is to separate objects quickly and regularly by using pistons according to the color data received from the sensors on the system. This system approaches the level of automation which uses circuit elements such as sensors and relays.

System principle: In the system where a total of 2 cylinders will be used, the color sensor located in front of the first cylinder is designed to detect the color of the object and transmit this data to Arduino or similar circuit boards.

Arduino will use the color data to determine at what angle the servo motor should rotate. Then, 1st piston will move forward and push the object in front of 2nd piston, the table on which the 2nd piston is fixed will rotate to the required angle via the servo motor, and then the 2nd piston will push the object to the desired area.

Finally, the 2nd piston will return to its initial position and be ready to pick up the next object.

In this way, the system will continue to work continuously. In addition, the forward and reverse speeds of both pistons in the system can be adjusted as needed, and piston dimensions, forces, stroke lengths can be changed according to need.

In conclusion, pneumatic color-based object sorting automation provides a compact design and cost advantage, aiming to increase productivity in industrial production. This allows businesses to use their resources more effectively and helps them stand out in the competitive market.

**Keywords:** Arduino, piston, sensor, color, cylinder.

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# Increasing Drone Takeoff stability using PID Control System and Cheetah Optimization Algorithm

*Beytullah BOZALİ* [1]
*Doğukan TEKİNER* [2]

## Abstract

In this study, an effective Proportional-Integral-Derivative (PID) control system and The Cheetah Optimizer (CO) algorithm were used to increase the take-off stability of drones and their performance during the take-off process was examined. Take-off systems, which enable drones to remain stable in the air, have become an important research area with today's technological developments. In our study, the drone engine was modeled using the MATLAB Simulink application. PID control system and CO algorithm are integrated to reduce fluctuations in drone takeoff and make takeoff smoother. PID control system has been used to optimize the performance of drone motors. PID coefficients were compared with Matlab Turned and CO algorithm and the most suitable coefficients were determined. The CO algorithm was used as a heuristic optimization method to improve the performance during the take-off process of the drone. By using the PID control system and CO algorithm together, fluctuations in the take-off process of the drone are reduced and take-off stability is increased. In this study, the use of an effective PID control system and CO algorithm to increase the take-off stability of drones was examined. This approach can make significant contributions to the development of drone technology, allowing it to be used more safely and efficiently in daily life. This study stands out as an important step for drones to take off successfully.

**Keywords:** Stability, Dron, PID controller, CO algorithm, Optimization

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# Optimizing Load Frequency Control in Power Systems Using Cheetah Optimizer Algorithm for PID Controller Design

*Beytullah BOZALİ* [1]
*Hilmi KARABAŞ* [2]

## Abstract

The purpose of a transaction; It is to reduce the oscillations in power changes that occur in the system frequency and in the connection lines between connected control zones due to consumer demands or other disruptive factors, as soon as possible and to the lowest level. Load Frequency Control (LFC) is required to achieve this purpose. LFC is a critical control process to ensure the balance between production and consumption because it is necessary to minimize oscillations in frequency and power changes. Failure to keep the Load Frequency at the desired level may cause frequency and voltage fluctuations in the system; This can lead to power quality problems and system crashes. Our study deals with the Proportional-Integral-Derivative (PID) controller design and optimization of a single area power system modeled in the Matlab Simulink environment for LFC. A new heuristic method, The Cheetah Optimizer (CO) algorithm, was used to find PID parameters. The performance of the proposed CO algorithm, PID controller is compared with the performance of conventionally tuned PID controller. Analysis shows that the CO-PID controller is better in terms of fast localization of frequency oscillations, limited peak overshoot and damping values. The results show that optimizing the PID controller with the CO algorithm provides an effective and stable solution for frequency control in interconnected power systems. The distinction specifically shows that the CO-PID controller is best in terms of fast settling of frequency oscillation, limited peak overshoot values, and undershoots.
**Keywords:** Load frequency control, PID controller, CO algorithm, Power system, Optimization

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# Self-Balancing Robot with Arm

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*Mustafa ENGİN*[2]

## Abstract

In this document, the development and control algorithm of a two-wheeled self-balancing robot with a robotic arm are discussed. To enhance its robustness during the manufacturing process, insulating structural materials are predominantly used for iron shafts and electronic components safety. The general outlines of this insulating material are created with the assistance of computer-aided design. During the mechanical design modeling, the aim is for the project to be self-sufficient without any external assistance, capable of successfully performing tasks in all situations. In the hardware section, the wheels that enable the system to remain stable are driven by encoder-equipped and geared DC motors. The active balance system of the robot establishes a connection with the Earth's gravity through the data obtained and processed from the accelerometer sensor. Unwanted parasitic effects and erroneous data values due to various conditions are minimized through the internal encoder on the geared DC motor. The dependence of the system on external factors is eliminated by the servo motors around the robot, which are used for the mobility of the robot arm. As the system has a dynamic structure and requires stable balance, a PID (Proportional-Integral-Derivative) control algorithm is applied as an active control mechanism. What sets this work apart is the ability of the robot arm to pick up a box from its location, maintaining balance with the weight of the robot and the carried object. Two different microcontroller boards are used in this system, with Arduino Mega serving as the primary control board overseeing the basic control systems of the robot, while Raspberry Pi, with its easily integrable camera, handles communication between the robot and the external world.

**Keywords:** PID, Arduino Mega, Raspberry Pi, Self-balancing, Algorithm

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# Endüstriyel Kuruluşlarında Gürültü Kirliliği, İç Ortam Hava Kalitesi ve Aydınlatma Etkinliği Parametrelerinin Değerlendirilmesi

*Semih Çağrı YAĞCIOĞLU*[1]
*Murat SOLAK*[2]

## Abstract

The condition of the indoor environment in industrial production companies is examined with different parameters. Parameters such as indoor air quality, noise pollution and lighting efficiency are used to evaluate the indoor environment. The condition of the indoor environment significantly affects employee health and therefore production efficiency. Indoor air quality in enterprises varies according to the scope of the product produced. Indoor air quality is determined by parameters such as CO2, PM (Particulate Matter). Indoor noise pollution is another parameter that needs to be addressed in terms of the health of employees in enterprises. Noise pollution, which is evaluated within the scope of OHS, is evaluated within the scope of the relevant regulations. Lighting efficiency of workplaces is another parameter that needs to be measured as it affects the efficiency of the work done, the eye health of the employees and the energy consumed. For this reason, providing adequate lighting is very important in terms of environmental sustainability as excessive lighting increases energy consumption. In this study, the importance of the parameters by which indoor air quality is determined and the regulations within which they are evaluated are examined.

**Keywords:** Indoor air quality, lighting efficiency, noise pollution

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# Comparative Analysis of Processing Methods for Fermented Products Generated in Biogas Facilities in Terms of Environmental Impacts

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*Ebru KOCA AKKAYA*[2]

## Abstract

In the fight against global climate change, reducing the use of fossil fuels and adopting clean energy technologies has become crucial. In this context, biogas processes, which involve the production of energy from organic waste, play a critical role environmentally. These facilities, operating at various scales, hold significant potential for reducing greenhouse gas emissions compared to fossil fuels due to their energy production. However, to minimize the impact of these facilities on the ecosystem, it is essential to accurately analyze and manage the process outputs.

The aim of this study is to contribute to the selection of appropriate methods by comparing the global warming and other environmental impacts of various treatment methods for the fermented product generated in biogas facilities, based on a review of literature. To achieve this goal, the comparison of different management processes of the fermented product in biogas facilities was addressed through a life cycle assessment (LCA) method. The results obtained mainly through the SimaPro and GaBi software tools were evaluated during the analysis of the life cycle assessment of the fermented product generated in various biogas facilities. Among the scenarios analyzed for the effects of processing the fermented product, the scenario involving the processing of the raw fermented product into two output phases spread directly on agricultural soil and through phase separation, was considered to have the lowest environmental impact.

Upon examining the environmental impacts of different processing methods of the fermented product through life cycle assessments, it was observed that belt drying had the highest impact in terms of global warming potential, while physical-chemical treatment, composting, and sun drying applications exhibited the best performance.

**Keywords:** Biogas, Fermented product, Life cycle assessment, Global warming, Greenhouse gas emissions

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# The Impact of Logistics 4.0 on Green Logistics

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## Abstract

While the logistics sector causes significant greenhouse gas emissions through transportation activities, these activities also generate large amounts of packaging waste. Therefore, it has negative impacts on climate change and the environment. However, given the need for growth and development of businesses, it is inevitable to continue activities. Industry 4.0 technologies have increased the ability of businesses to produce cost-effectively and responsive to customer demands. This has not only brought a change in production, but also accelerated the development and further use of digitalization, automation, integration, data collection and analysis systems of logistics operations. Thus, the concept of logistics 4.0 has emerged. Logistics 4.0 applications not only provide economic gains to businesses but also offer opportunities to develop sustainable logistics practices. Green logistics is an approach that aims to reduce the environmental impact of traditional logistics activities and manage them in accordance with the principle of sustainability. This study investigates the applicability and impact of logistics 4.0 on sustainable green logistics. Research findings show that logistics 4.0 applications such as route optimization and smart transportation methods provide both economic value for companies and minimize environmental damage by reducing carbon emissions and waste generated by smart systems. It has also shown that it offers more environmentally friendly, economical and sustainable solutions by contributing to the development of a green logistics system and providing fast and accurate data flow.
**Keywords:** Logistics 4.0, Green Logistics, Industry 4.0, Sustainability.

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# Removal of pollutants using algae in the remediation of wastewater

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## Abstract

Water pollution is one of the environmental problems that has increased considerably in recent years and is becoming more and more worrying every day. Wastewater resulting from industrial activities, agricultural practices and domestic uses deteriorates the natural properties of environmental assets such as soil, air and water due to its high amount of nutrients, heavy metals and chemical content, and causes serious damage to human and animal health. The composition of wastewater is becoming more complex every day and effective, easily applicable and environmentally friendly practices in treatment processes are becoming increasingly important. In nature, on the one hand, streams flowing through natural or anthropogenic means carry pollutants in different amounts and concentrations to the receiving environment, on the other hand, algae that grow naturally in aquatic environments remove organic and inorganic components from aquatic environments through various mechanisms. Algae not only remove nutrients, heavy metals and toxins in aquatic environments, but also provide oxygen to the environment, making it easier for aerobic bacteria to mineralize organic pollutants. Algae are ubiquitous in nature and are well adapted to a wide variety of habitats, so the biomass that grows and multiplies can be used in many sectors as a valuable product. The remediation strategy with the use of algae is also very effective in avoiding the use of costly and environmentally harmful chemicals in wastewater treatment. With the use of algae in wastewater treatment, pollutants in wastewater can be considered as nutrients that feed algae and thus phosphates, nitrates, heavy metals, pesticides, hydrocarbons, nitrogen and phosphorus are removed. For this purpose, the removal of pollutants by using algae in wastewater remediation is discussed in this study.

**Keywords:** Remediation of Wastewater, Algae, Removal of Pollutants, Phycoremediation, Water Pollution.

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# Obtaining Raw Material For Use in Biodiesel Production From Waste Animal Fats: First Step To Biodiesel

*Cemre YILMAZ*[1]

## Abstract

In recent years, research into biodiesel, a fuel derived from animal and vegetable fats, has accelerated. This surge in interest stems from the pressing need to address global pollution and reduce exhaust emissions, a challenge that has driven the adoption of alternative fuels. Additionally, the continuous rise in petroleum prices has fueled the search for viable alternatives.The escalating energy demand and over-reliance on fossil fuels have triggered a cascade of environmental concerns, including pollution and resource depletion. Consequently, the transition towards sustainable alternative energy sources has become imperative. Biodiesel emerges as a frontrunner solution in this endeavor. Derived from animal and vegetable oils, biodiesel offers a renewable and sustainable fuel option, holding the potential to reduce fossil fuel dependency and mitigate environmental degradation.Animal waste fats, a substantial byproduct of the food processing industry, are typically disposed of through conventional methods, leading to environmental contamination. However, utilizing these waste fats as feedstock for biodiesel production presents a compelling opportunity to transform waste into a valuable resource. Nevertheless, animal waste fats harbor solid wastes and residues arising from process outputs and environmental conditions. Therefore, feedstock pretreatment is essential prior to biodiesel production. This pretreatment step entails the removal of solid wastes and residues from the animal waste fats, ensuring feedstock quality.The utilization of animal waste fats for biodiesel production represents a significant leap towards sustainability. This process transforms a waste product into a valuable energy source, simultaneously mitigating environmental pollution.

**Keywords:** Biodiesel, waste animal fat, pretreatment for biodesel

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# Effect of Acidification of Global Ocean Waters on Shellfish

*Dilay TUNOĞLU*[1]
*DEMİRCAN YILDIZ*[2]

## Abstract

The aim of this research is that with the beginning of the industrial revolution, atmospheric CO2 gas has been released into the shell structure of Pteropods (Sea butterflies), which are a group of invertebrate shelled ocean creatures, with the deterioration of the balance of the world's atmosphere as a result of the increase in human activities and increasing greenhouse gas emissions in the last centuries, and therefore the decrease in the pH values in the ocean water, that is, the acidification of the ocean water. The aim is to investigate how and to what extent the shells are affected by this situation by using snail shells with similar shell structure. First, two different experimental setups were prepared by considering the pH value of today's ocean waters (8.1) and the pH value estimated in 2100 (7.6). Two snail shells of different sizes were placed in both experimental containers. Mass changes, shell abrasions and changes in light transmittance that occurred in the snail shells in the experimental setups within 35 days were examined regularly every week. Three repetitions were made for the prepared experiment. The results of all three repetitions were similar. As a result of this research, it was determined that the pH value change in ocean water caused damage, mass loss and thinning in the shells of snails, which have the same shell structure as Pteropods (Sea Butterflies), which are from the invertebrate shellfish group. The pH level of today's ocean waters was compared with the pH level predicted in 2100 to investigate how it would affect shellfish. As a result of the research, it is thought that ocean acidification will damage the shell structure of pteropod creatures and may pose a danger to the vital activities of pteropod creatures.

**Keywords:** Ocean Acidification, Global Warming, Pteropod

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# Investigation of Probiotic Properties of Bacteria Isolated from Raw Milk and Yoghurt Samples

*Ayşe ÖĞ*[1]
*Buket KUNDUHOĞLU*[2]

## Abstract

As people's interest in healthy nutrition increases, their interest in probiotic foods has also increased. Probiotics are defined by FAO and WHO (2002) as "live microorganisms that have positive effects on human health when taken into the body in sufficient amounts".

This study was carried out with the aim of determining whether the bacteria isolated from raw cow's milk and yoghurts obtained from this milk by two different methods are lactic acid bacteria or not and to investigate the probiotic properties of these lactic acid bacteria (LAB). In this research, two different raw milk samples were taken from Seyitömer Town of Kütahya province and lactic acid bacteria (LAB) were isolated. Additionally, yoghurt was obtained from these milk samples using two different methods, without using commercial yeast. A total of 116 bacterial isolates were obtained from two different raw milk samples and two yoghurt samples. Among these isolates, 23 isolates that were gram positive, catalase negative, non-spore-forming and non-motile were accepted as possible LAB and were stocked for use in other studies. 7 of these isolates are in the form of bacilli and 16 are in the form of cocci. First of all, tests were performed to determine the virulence factors of LAB isolates, and 4 β-hemolytic isolates were not included in the remaining parts of the study. Since 5 of the 19 isolates were entrococci, they were not included in the remaining studies. To determine the probiotic properties of the remaining 14 isolates, their properties such as survival at low pH, bile salt environment and artificial gastric fluid were determined.

As a result, 5 isolates that could survive at low pH values, bile salt and artificial gastric fluid were obtained. These isolates have the potential to be used as starter cultures in the production of probiotic natural yoghurt.

**Keywords:** Probiotic, Lactic Acid Bacteria, Probiotic Yoghurt, Isolation, Milk

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# Revitalizing Fermented Flavor: Kombucha

*Sibel TOKTAY*[1]
*Cihan DÜŞGÜN* [2]

## Abstract

The fermented tea beverage known as kombucha has gained popularity for its potential health benefits. It is produced by fermenting sweetened tea with a Symbiotic Culture Of Bacteria and Yeast (SCOBY), resulting in a slightly effervescent drink that can vary in flavor profiles depending on the ingredients used and the fermentation time. Some beneficial effects attributed to kombucha, such as antioxidant and antimicrobial activities, as well as antidiabetic and anticarcinogenic effects, have already been reported. Kombucha is known for its probiotic properties, which can support gut health, and it also contains antioxidants and organic acids. This beverage has been consumed for centuries and has recently seen a resurgence in popularity due to its perceived health benefits and unique taste.

**Keywords:** *Fermentation, Health, Probiotic Antioxidant, Antimicrobial*.

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# Anatomical Adaptations of Artemisia santonicum subsp. santonicum in Different Salinity Gradients

*Merve AŞIK* [1]
*Tülay AYTAŞ AKÇİN* [2]

## Abstract

Salinity is one of the major environmental stress affecting plant growth and productivity.The plants develop various tolerance strategies in response to salt stress. It was determined that many of the anatomical characters are associated with salinity tolerance. The genus *Artemisia L.* belonging to Asteraceae contains upwards of 500 species is one of the largest genera in the family. However, few studies have been conducted to access salt tolerance this genus. In this study, *Artemisia santonicum* subsp. *santonicum* (facultative halophyte plant) has been analyzed root and stem anatomical changes when exposed to different degrees of salinity. Samples were collected from saline soils of Kızılırmak Delta,Bafra,Samsun/Turkey. The salinity value in soil samples was measured as low (2,64 ds $m^1$), the medium (5,81 ds $m^1$), and the high (9,30 ds $m^1$) The results indicated that root anatomical characters as periderma width, cortex width, cambium thickness, phloem thickness, xylem thickness, number of trachea significantly increased in highly salinity. Increased cortex parenchyma thickness and phloem thickness in stem seemed to be crucial for adaptation under saline environments.There was an decrease in the diameter of vessel elements in stem with increasing salt levels. Our results showed that root and stem anatomical characters are important in the adaptations of *Artemisa santonicum* subsp.*santonicum* to salinity stress.

**Keywords:** Artemisia, Salinity, Anatomical adaptations, Root Anatomy, Stem Anatomy.

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# Identification of the Morphometric Characteristics and Genetic Structure Of African Catfish (*clarias Gariepinus* Burchell, 1822) Populations Living in Turkish Rivers Using Microsatellite Markers

*Şafak KAYA*[1]
*R. Serap ERGENE*[2]

## Abstract

In this study, investigates the morphometric characteristics of five different populations of *Clarias gariepinus* found in the Asi, Seyhan, Ceyhan, Göksu, and Sakarya Rivers, as well as the genetic structure of two populations from the Asi and Göksu Rivers using microsatellite markers.
Morphometric measurements were conducted using 10 samples from each of the specified locations, with 25 parameters determined for the morphometric measurements. Fish samples collected from the Asi and Göksu rivers were brought to the laboratory, where muscle tissue was extracted for genomic DNA isolation. A total of 11 microsatellite loci were utilized as microsatellite markers.
Statistically significant differences were found between the Asi and Göksu populations in terms of 17 out of the 25 morphometric parameters ($p<0.001$). While the Asi, Seyhan, and Ceyhan populations showed similarities, the Göksu population differed from these groups, and the Sakarya population was distinct from all groups in the sampled populations.
The fragment analysis results using 11 microsatellite loci revealed that data couldn't be obtained for the Cga07 locus, and therefore it was excluded from the assessment. Among the 10 examined loci, small genetic differentiation was observed among populations for 3 loci (Cga01, Cga05, and Cga09), moderate genetic differentiation for 1 locus (Cga11), significant genetic differentiation for 2 loci (Cga03 and Cga10), and very significant genetic differentiation for 4 loci (Cga02, Cga04, Cga06, and Cga14) between populations. The average $F_{ST}$ value for the 10 loci was found to be 0.2493, indicating substantial genetic differentiation among populations.
**Keywords:** *Clarias gariepinus*, microsatellite, morphometri, Asi river, Göksu river

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# Bio-ecology of the Invasive Lessepsian species Lionfish (Pterois spp.) Spreading in the Eastern Mediterranean Region of Turkey.

*Hayri Ertuğrul ÇETE*[1]
*R. Serap ERGENE*[2]

## Abstract

The opening of the Suez Canal and the mixing of the two seas have caused significant changes in the Mediterranean ecosystem. In addition, the observed global climate change, changes in regional temperature and sea water temperature cause living organisms to change their natural habitats and search for new habitats. It creates a suitable environment for species (Lessepsian) coming to our region from the Red Sea. Lionfish (Pterois spp), one of these species, is a Lessepsian species that spreads very rapidly in the Mediterranean. It causes changes in the fish biodiversity of the eastern Mediterranean. In order to understand the extent of these changes in our region, its basic biology and ecology were analysed. In our study, we collected samples and ecological data by making regular dives for two years at 4 stations where we determined that the lionfish population was dense. The collected samples were examined for length, weight, stomach content.

The average fishing depth of lionfish, which we generally encounter in rocky areas, is 12.3 metres. The smallest individual was 6 cm, the longest individual was 38 cm and the average length was 24.48 cm. The weakest individual weighed 1.3 g, the heaviest 769 g and the average 229.38 g. According to the stomach content, 77.5% of the diet consisted of small fish and 5.9% invertebrates.

Having few predators due to its venomous fin rays, fast growth, early puberty, hunting success, opportunistic feeding diet indicate that lionfish has a permanent and growing population in our region. Its presence in rocky areas and poisonous rays make fishing difficult. Finding and protecting the predators who hunt lionfish is the only precautionary measure.

**Keywords:** Invasive species, Lessepsian, Lionfish, Pterois, East Mediterranean.

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# From Kaz Mountains Modeling to Biodiversity

*Defne Su DEMİRTAŞ*[1]
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*Lale ULUIŞIK*[3]
*Ayşe Betül ÇUZUKOĞLU*[4]
*Yağmur İrem DURMUŞ*[5]
*Deniz DEĞER*[6]

## Abstract

The aim of this project is to measure and increase the knowledge of 7th grade Ankara Etimesgut BİLSEM students about the concept of biodiversity in the 2023-2024 academic year through the Kaz Mountain Modeling example. For this purpose, the Kaz Mountain Modeling Construction Guide was prepared within the scope of the project and a seven-week training program was structured. Mixed method was preferred to evaluate our project, using both qualitative and quantitative methods together. The quantitative part of the research was created by applying the Environmental Attitude Scale and the Biodiversity and Conservation Achievement Test as pre- and post-tests. For the qualitative part of the research, the Kaz Mountain diaries interview form was used. It was observed that there was no significant difference (p>05) between the pre-test and post-test in the results of the environmental attitude scale, but when the pre-test results were examined, it was concluded that the environmental sensitivity of the experimental group consisting of science and art center students was high, and their views improved in the post-test. The results of the biodiversity and conservation achievement test show that the students' academic success has increased (p<05). According to the descriptive analysis of student diaries, biogeography (f = 74) was determined as the conceptual category with the highest frequency. The following conceptual categories are plant biodiversity (f=23), modeling (f=22), animal biodiversity (f=20), species diversity (f=19), endemic species (f=13), cultural ecology (f=8). ) and intraspecific diversity (f = 3). As a result, while the educational program has advantages such as increasing student motivation, keeping the sense of curiosity alive, providing a deeper understanding of scientific facts, and improving planning and collaboration skills; Factors such as the cost of the model and time aredisadvantages.

**Keywords:** Kaz Mountain, Biodiversity, Modeling, Biogeography, Kaz Mountain Modeling Construction Guide

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# From Data to Action: Transforming Pressure Testing in Manufacturing with Machine Learning for Enhanced Energy Efficiency

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## Abstract

This study investigates the use of machine learning techniques to enhance the efficiency of pressure drop tests, essential for assessing product and process accuracy at various production stages. Traditional pressure testing methods, known for their high energy consumption and extended durations, pose significant challenges to industrial enterprises. These tests are crucial not only for quality assurance but also for leak detection, ensuring product safety and structural integrity. Utilizing a comprehensive dataset of 1.7 million records collected over more than a year, this research meticulously analyzed the dynamics of testing processes to pinpoint opportunities for substantial improvement. A predictive model developed using various machine learning algorithms has successfully reduced the duration of pressure tests from an average of ten seconds to as low as two seconds, significantly boosting process efficiency and reducing energy consumption. The model's high performance, evidenced by its Root Mean Squared Error (RMSE) and $R^2$ values, has led to considerable cost savings and enhanced environmental sustainability in production processes. This work not only demonstrates the effectiveness of machine learning in industrial applications but also highlights its potential to revolutionize traditional practices, underscoring the critical role of machine learning in achieving operational efficiency and sustainability goals within the manufacturing sector.

**Keywords:** Machine Learning Optimization, Test Efficiency, Environmental Sustainability, Energy Consumption Reduction

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# Polymer Composite Electrolytes in Lithium-Sulfur Batteries

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## Abstract

Lithium-sulfur (Li-S) batteries have garnered significant attention as potential successors to traditional lithium-ion batteries due to their high theoretical energy density and lower production cost. However, they face several challenges that hinder their commercial viability. During the charge-discharge cycle, sulfur tends to dissolve into the electrolyte, causing loss of active material and capacity fade over time, known as the polysulfide shuttle effect, reduces the battery's cycling stability. Additionally, sulfur's poor electrical conductivity limits rate capability, leading to low power output and slow charge-discharge kinetics. Sulfur undergoes significant volume expansion and contraction during cycling. This can cause electrode degradation, loss of electrical contact, and ultimately, decreased battery performance and cycle life. Moreover, the formation of soluble polysulfides in the electrolyte can lead to the formation of dendrites, which may cause internal short circuits and compromise battery safety. Polymer composite electrolytes offer multifaceted advantages for enhancing the performance and safety of Li-S batteries. Firstly, they serve as effective physical barriers, impeding the migration of polysulfides between the electrodes. This pivotal role mitigates the polysulfide shuttle effect, thereby bolstering the cycling stability and preserving the capacity over multiple charge-discharge cycles. Additionally, by incorporating suitable additives or nanostructured fillers, polymer composite electrolytes can enhance the ionic conductivity of the electrolyte matrix. This facilitates faster ion transport within the battery, enabling higher charge-discharge rates and improved power performance. Furthermore, polymer composite electrolytes enhance Li-S battery safety by preventing dendrite formation, reducing the risk of short circuits and improving overall reliability. These advancements contribute to the development of more efficient, durable, and safer Li-S battery technologies for various energy storage applications. In this study, novel electrolyte structures including ceramic polymer nanocomposites have been studied and compared.

**Keywords:** polymer composites, electrolyte, lithium-sulfur batteries, shuttle effect, ceramic particles

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# Kınetıc And Thermodynamıc Parameters To Evalute Oxıdatıve Stabılıtıy of Vegetable Oils

*Abdullah Sinan Colakoglu*[1]

## Abstract

This study aimed to investigate the oxidative stability of sunflower, canola, corn, cotton seed, pomace and soybean oils oxidized under isothermal conditions (130-140 ºC) in differential scanning calorimetry. From the obtained thermograms, oxidative induction time (OIT), peak maximum ($\tau_{peak}$), total oxidation time ($\Delta\tau$) and oxidation area determined. Reaction rate constant (k), thermal coefficient ($T_c$) and thermal acceleration factor ($Q_{10}$), and frequency factor (A) and activation energy ($E_a$), and standard enthalpy ($\Delta H^{\ddagger}$), entropy ($\Delta S^{\ddagger}$) and Gibbs free energy ($\Delta G^{\ddagger}$) of activation were also calculated. The increase in temperature caused a decrease in OIT, τpik and $\Delta\tau$, and an increase in the oxidation area, k constant, $T_c$ coefficient and $Q_{10}$ factor. Temperature increase of every 10 ºC had resulted in an average 2-fold decrease in OIT and an average 1.6-fold decrease in $\tau_{pic}$. The $E_a$ of pomace oil, which has the longest OIT was the lowest, while the $E_a$ of sunflower oil, which has the shortest OIT was the highest. The combination of negative $\Delta S^{\ddagger}$ and positive $\Delta H^{\ddagger}$ and $\Delta G^{\ddagger}$ values of the oils had confirmed that the oxidation reactions in the oils do not occur spontaneously In the study, the lowest negative $\Delta S^{\ddagger}$, highest positive $\Delta G^{\ddagger}$ and the lowest positive $\Delta H^{\ddagger}$ were determined for pomace oil, while the highest negative $\Delta S^{\ddagger}$, highest positive $\Delta G^{\ddagger}$ and the largest positive $\Delta H^{\ddagger}$ were determined for sunflower oil. In conclusion, the kinetic and thermodynamic results have confirmed that the oxidation of oils is a non-spontaneous, endergonic, and endothermic reaction.

**Keywords:** Vegetable oils, Oxidation, DSC, Kinetic

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# Investigation of the Lower Limb Asymmetry in Elite Female Football Players with Jump Test and Wearable Movement Analysis System

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*Begüm YALÇIN*[2]
*Hande ARGUNŞAH*[3]

## Abstract

Football, particularly among elite female athletes, is associated with a higher risk of injury due to high-impact movements. This study explores the significant role of lower limb asymmetry as a risk factor for injuries, focusing on balance and strength disparities between the dominant and non-dominant legs. Employing a detailed kinetic and kinematic analysis, the research utilizes the Drop Vertical Jump (DVJ) test, which incorporates two critical landing phases often underexplored in previous studies. The hypothesis of the study suggests that notable biomechanical differences between landings will provide detailed insights into joint kinematics, uncovering important variations throughout the different landing phases. The research employs the DVJ test, distinguished by its inclusion of two landing phases: the initial and the secondary landing phases. These phases are marked by the moment of initial contact with the dual force platform when the center of mass (COM) is at its lowest. The participants, 10 elite female football players aged 24.4 years (SD= 5.9 years), performed the DVJ from a 30 cm high platform. Each participant is required to complete at least three DVJ to ensure data reliability. Kinetic data, including forces and powers exerted upon landing, were measured using the dual force platform (Vald Force Deck). Simultaneously, Xsens Awinda is used to collect kinematic data from participants, therefore 17 wireless motion tracker sensors attached to participants specific segments to captured detailed kinematic data at the hip, knee, and ankle joints. This setup allowed for a precise analysis of the changes in the COM and the biomechanical behavior of the lower extremities throughout the landing phases. As a pilot study, the results of this research will serve as a reference for how limb asymmetry could be correlated with factors such as height, weight, playing position, and injury history in future studies.

**Keywords:** Drop Vertical Jump (DVJ), Lower Limb Asymmetry, First and Second Landing, Kinetic and Kinematic Analysis

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# Low-Cost Solid Fuel Rocket Engine Design

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## Abstract

Rocket studies carried out at universities can often only be tested in a simulation environment rather than being tested in real flight conditions. Providing appropriate test conditions is important to detect and solve unforeseen errors in the simulation environment. Providing a test environment can be achieved by manufacturing the rocket and test firing it. The engine required for test firing is not a product produced and sold commercially in our country. Since its usage area is low and the commercial market is low, there are few accessible information sources. Therefore, the production and development stages include many tests and points that need to be experienced. The excess of these stages may increase costs or increase the workforce. In the study, the PVC K1000 engine belonging to Richard NAKKA, which is a study on a low-cost solid fuel rocket engine, was examined and theoretical information was given about the engine design, and a similar engine design was rearranged and simulated on a simple model rocket via OpenRocket, and its effect on flight was examined and the effect of another engine containing standard composite solid fuel on the flight values of the same rocket was compared. According to the results, alternative ways and engine improvements were examined to eliminate the inefficiency of thrust arising from the lower combustion values of easily accessible potassium nitrate. The shape of the fuel core was kept constant and the effects of the mixture ratios and particle sizes on the combustion patterns and thus on the thrust graph were determined.

**Keywords**: aviation, experimental, solid propellant rocket engine, rocket, low cost

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# Bird Bread (Polygonum aviculare L.) extract as high efficient green corrosion inhibitor for the mild steel

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*Reşit YILDIZ*[2]

## Abstract

Steel and alloys are widely used in many applications such as chemical, petrochemical, thermal and nuclear power plants . Thus, steel corrosion is an important issue in these applications when acid solutions such as sulphuric and hydrochloric acids are employed in the pickling, acid descaling and chemical cleaning . In this point, green corrosion inhibitors become prominent due to some outstanding properties like sustainable, inexpensive, easy preparation and degradable. These green corrosion inhibitors comprise hetero-atoms, π-electrons and sensitive active branches, that can easly contact on the steel surface and give rise to high corrosion protection in acid solutions . In the light of this information, in this study, a green inhibitor as known bird bread (*Polygonum aviculare L.*) is employed to be investigated the anti-corrosion effect of mild steel in 1 M HCl. Electrochemical impedance spectroscopy (EIS), linear polarisation resistance (LPR) and potentiodynamic polarisation (PP) techniques are used as the electrochemical methods. Scanning electron microscopy (SEM) and atomic force microscopy (AFM) are utilized to understand the surface characterizations after 120 h immersion times. Results showed that this green inhibitor significantly reduced the corrosion of mild steel (MS) in 1 M HCl solution as shown in Figure 1. It is obtained that inhibition efficiency improved due to increasing plant extract concentration. Adsorption isotherm obeyed the Langmuir style. Surface analysis showed that very good protection is observed on the MS surface with the addition of plant extract in acid media while bare MS surface is destroyed very badly. Accordingly, bird bread can be used safely in industrial applications as a promising environmentally friendly corrosion inhibitor.

**Keywords:** Bird Bread, Mild steel, Green Corrosion inhibitor

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# Synthesis and Characterization of New Amino Substituted Styryl Bipyrimidine Derivatives and Investigation of the Effect of Amino Group on Thermal and Optical Properties

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*Huriye AKDAŞ KILIÇ*[2]
*Belkıs BİLGİN ERAN*[3]

## Abstract

Liquid crystals are extensively researched for diverse applications, spanning from displays to wearables. Their mesomorphic properties are directly linked to their molecular structure. Traditional thermotropic liquid crystal molecules feature a rigid aromatic core with attached long aliphatic chains. Recent results showed that bipyrimidine core functionalized with alkoxy styryl groups, exhibits multifunctionnal properties such as strong linear and non-linear optical properties and mesomorphic properties. Studies employing ether and amino end groups reveal superior optical properties due to the latter's because of their better donor capacity [1-3].

The aim of this study, is the synthesis of new bipyrimidine derivatives presenting amino donor group which can provide mesomorphic properties by using long aliphatic chains in addition to the stronger optical properties. The chemical structures of the synthesized intermediate and target molecules were characterized by $^{1}$H-NMR, $^{13}$C-NMR and FT-IR spectroscopic methods, and optical and thermal properties were examined by polarization microscopy (PM) and differential scanning calorimetry (DSC).

This study was supported by TUBITAK 2232-A International Fellowship for Outstanding Research Program (Project number: 118C273)

[1] B. Gu et al., “Molecular nonlinear optics: Recent advances and applications”, Advances in Optics and Photonics, vol. 8, no. 2, 328-369, 2016.

[2] U. Bora et al., “New Multifunctional Bipyrimidine-Based Chromophores for NLO-Active Thin-Film Preparation”, Chem. Eur. J. e202302930, 2023.

[3] P. Nicolas et al., “Non-linear optical activity of chiral bipyrimidine-based thin films”, Chemistry – An Asian Journal, e202400112, 2024.

**Keywords:** Liquid crystal, Nonlinear Optics, Bipyrimidine, Donor, Acceptor

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# Exploring an electrochemical MIP Sensor for the Detection of the Tamoxifen Metabolite: 4-Hydroxytamoxifen.

*Aysu YARMAN*[1]

## Abstract

The analysis of pharmaceuticals and their metabolites is widely recognized for its significant relevance across various areas, including drug development, clinical practice, and environmental monitoring. In drug development, analytical methods play a crucial role in understanding the metabolism of drugs, thereby enhancing their efficiency and safety profiles. Additionally, these methods contribute to achieving optimal therapeutic outcomes in clinical settings. Consequently, various analytical methods have been developed. Electrochemical methods offer a promising alternative to traditional techniques due to their cost-effectiveness, ease of use, and lower detection limits.

Here, an electrochemical MIP sensor for the metabolite of the anticancer drug tamoxifen (TAM), 4-Hydroxytamoxifen (HTAM), is described. The sensor is prepared through electropolymerization of an o-phenylenediamine-resorcinol mixture in the presence of the template molecule directly on the surface of a glassy carbon electrode. All steps of MIP synthesis and rebinding were analyzed using cyclic voltammetry, which evaluates the permeation of the redox marker ferricyanide through the MIP film to the electrode. The biomimetic sensor exhibited a linear response in the concentration range of 0.05 nM to 1 nM. Furthermore, it demonstrated a 2-fold higher affinity for rebinding of HTAM (the template) compared to the drug tamoxifen. The MIP sensor covers the relevant concentration range for HTAM after the intake of the typical doses of TAM in breast cancer treatment, after a 1:10 dilution of the serum samples. The concentration dependence for HTAM by the One-Site Binding Model gives a value for the dissociation constant $K_D$ of 0.4 nM. This Kd-value and the measuring range are considerably lower than for the analogous MIP sensor using TAM as the template and the same functional monomers.

**Keywords:** Molecularly Imprinted Polymers, Biomimetic Sensors, Tamoxifen Metabolites, 4-Hydroxytamoxifen, Breast Cancer

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# Synthesis, Characterization and Thermal behavior of The Poly(vinyl N-thiazolin-N-benzoylthiourea)

*Gülşah KURT*[1]

## Abstract

In the last decades, benzoylthiourea derivatives have received considerable attention owing to coordination properties, biological, catalysis, environmental, analytical applications. Benzoylthiourea is highly capable of forming stable complexes with transition metal ions. Its chemically remarkable property is that it is a coordination agent with strong donor groups (carbonyl and thioamide). These benzoylthiourea ligands are bidentate and they coordinate to metals via both O and S atoms. In additionally, benzoylthioureas have been reported as extractants for various toxic or valuable metals such as Ni, Co, Ag, Pd, Hg and Au. In this study, polymeric structures containing benzoylthiourea groups were synthesized. 4-vinyl benzoyl chloride was obtained from the reaction between oxalyl chloride and 4-vinyl benzoic acid. Synthesized 4-vinyl benzoyl chloride then reacted respectively with potassium thiocyanate and 2-amino-2-thiazoline to form 4-vinyl N-thiazolin-N-benzoylthiourea monomer (4VBT2). 4VBT2 monomer successfully was polymerized using free radical polymerization conditions. A novel thiourea derivative 4-vinyl N-thiazolin-N-benzoylthiourea monomer (4VBT2) and its polymer poly(vinyl N-thiazolin-N-benzoylthiourea) (P4VBT2) were characterized by FT-IR, $^{1}$H NMR, $^{13}$CNMR. The molecular weights of polymer was also investigated with GPC. It showed high molecular weights, Mw = 3147474 g/mol and molecular weight distributions Mw/Mn around 1.93. The thermal properties of poly(vinyl N-thiazolin-N-benzoylthiourea) (P4VBT2) was investigated by the thermal analysis (TG/DTG) method.

**Keywords:** Benzoylthiourea, polymer, TGA

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# Fındık Kabuğundan Karbon Kuantum Noktalarının Formik Asit ve Asetik Asit ile Mikrodalga Yöntemiyle Üretimi ve Polifenol Oksidaz (PPO) Enzim Aktivitesinin İncelemesi

*Berfin TEKİN*[1]
*Durukan KOÇ*[2]
*Erdem ELİBOL*[3]
*Tuna DEMİRCİ*[4]
*Mine Nazan KERİMAK ÖNER*[5]
*Mustafa Oğuzhan KAYA*[6]

## Abstract

Polyphenol oxidase (PPO) is an enzyme responsible for enzymatic browning. This enzyme oxidises polyphenols found in fruits and vegetables, resulting in the formation of brown pigments. Controlling the activity of PPO is important to extend the shelf life of foods and prevent discolouration. Carbon quantum dot (QD) has become an important area of interest in nanotechnology in recent years. Carbon quantum dots are carbon-based nanomaterials, 0-10 nm in size, which have a wide range of potential applications. The biological activities of carbon quantum dots have been demonstrated in many studies such as antioxidant and antimicrobial properties. In this study, it was aimed to synthesis carbon quantum dots from hazelnut membrane by microwave synthesis method in an environment containing formic acid and acetic acid and to investigate their *in vitro* effects on PPO enzyme. It was investigated whether carbon quantum dots can inhibit PPO activity.

**Keywords:** Polyphenol oxidase (PPO), Carbon quantum dot (QD), Nanotechnology, Carboxylic Acids

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# Discussing Sustainable Neighborhood Parameters Through Green Certificates*

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*Gözde EKŞİOĞLU ÇETİNTAHRA*[2]

## Abstract

As the 20th century, rapid industrialization caused an increase in the population in urban areas. This increase not only brought spatial density, but also caused rapid consumption of the resources. This process has revealed the concept of "sustainability" and brought about some developments both in the academic field and practice, such as renewable energy, reduction in resource consumption, and self-sufficient settlements. Sustainability is based on economic, environmental, and social foundations. These foundations require a multidisciplinary approach to the subject. Space organization disciplines such as city planning, and architecture are a few of them. From the perspective of these disciplines, the concept of sustainability from the building-to-city scale is discussed via spatial the parameters. Buildings and urban areas are questioned through green certificates based on these parameters. Green certificates require inspections in the structural context and determine to what extent a building is sustainable. However, from urban and neighborhood scale the land use such as transportation systems and green area distribution, are also important to be examined in terms of sustainable environments. Despite this, studies showed that there are very limited number of certification systems at the neighborhood scale. This study tries to reveal which parameters should be taken into consideration in case of establishing a certification system at the neighborhood scale, by making an inquiry on the parameters examined by the existing national and international certification systems used at building-city scales and the criteria deemed necessary for sustainability in the literature. This study's findings will offer a significant contribution to the literature by questioning the parameters that should be considered in the spatial and policy context for sustainable neighborhood units.

**Keywords:** Sustainability, Sustainable Neighborhood, Certification Systems, Sustainable Development, Sustainable Design

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# Housing Problem in Industrial Cities In the Context of Special Industrial Zones

*Asım Buğra Akay*

## Abstract

The process of industrialization is a significant period that fundamentally alters the economic and social structures of modern societies and accelerates urbanization. With industrialization, large-scale migrations from rural areas to cities occurred, leading to rapid population growth in urban areas and the inadequacy of existing housing resources, resulting in the emergence of housing problems. In this context, the housing problem during the process of industrialization has been an important subject of research both economically and socially.

Within the scope of the thesis study, a literature review is conducted to first reveal the impact of the industrialization process on cities. Subsequently, the formation of worker housing during the industrialization process in Turkey and the housing crisis in industrial cities with the transition to Post-Fordist production are addressed. The next section examines the legal status of the special industrial zone and the possible housing problem in declared special industrial zones; recommendations are made regarding the potential of special industrial zones to mitigate the housing problem.

The concept of Special Industrial Zone emerged in our country in 2017 and has been a significant catalyst for industrialization and economic growth. However, considering the experiences in industrial cities in our country, it is believed that the housing needs of workers in special industrial zones cannot be adequately met. This study aims to provide an analytical framework to identify the potential housing problem that may arise in special industrial zones. Balıkesir Special Industrial Zone is selected as a case study area. This thesis aims to take a step towards understanding the housing problem in industrial cities and developing policy recommendations to solve this problem through Special Industrial Zones.

**Keywords**: Special Industrial Zone, Industrialization, Worker Housing, Lodgement.

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# What are the Variables of Tam Method Utilize in Bim Acceptance Research? 2000-2023 Sample

*Cansu YALNIZ*[1]
*Server Funda KERESTECİOĞLU*[2]

## Abstract

The Technology Acceptance Model (TAM) is employed in scholarly research to evaluate individuals' attitudes and intentions regarding the adoption of Building Information Modeling (BIM). This study aims to evaluate the publications in the literature where BIM acceptance is measured with TAM according to the variable used, population/sample group, data analysis method, and the findings obtained. The data source of the study, which is a document analysis within the scope of the qualitative research method, consists of publications between the years 2000-2023 filtered by using TAM and BIM keywords together in DergiPark, YökTez, Elsevier, and Scopus databases. Of the 51 studies identified, 19 studies accessed from Elsevier and Scopus databases were included in the scope of the research by applying the specified inclusion-exclusion criteria. The year, variable, population/sample, data analysis method, and findings of the 19 articles in which BIM acceptance was measured with TAM between 2000-2023 in the literature are tabulated. According to the table "Analysis of BIM acceptance studies with TAM," it was noted that as of 2013, there was minimum one study investigating per year. Most of the research took place in 2023. Studies spanned nine countries, with China leading. The analysis revealed that 50 different external variables were incorporated into the TAM model, with the most examined variables being “Behavior Control", "Subjective Norm", “Compatibility” and “Top Management Support”. Nineteen publications underscore that although there is a consensus on the benefit of BIM in the Architecture, Engineering, and Construction sectors, the adoption of BIM remains incomplete. Considering the analyses, it is crucial to classify the sample according to factors like age, project size, and level of BIM experience, and country. Based on the findings, several recommendations have emerged for future research such as examining the BIM acceptance of each stage of the project life cycle with TAM.

**Keywords:** Building Information Modeling, Technology Acceptance Model, Literature, Content Analysis, Variable.

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# Revitalization of the Wooden Mansion on Parcel 1159 in Büyükçekmece through Adaptive Reuse

*Ercan AKSOY*[1]

## Abstract

Adaptive reuse aims to utilize and preserve a structure with a new function beyond its original purpose. The method of adaptive reuse, one of the traditional techniques for conserving and preserving structures, is also recognized in international regulations and statutes. These regulations also specify considerations during the evaluation of new functions. Structures that undergo only restoration but are left unused witness a deterioration process that resumes, progressing rapidly. To prevent this, it may be necessary to alter the functions of these structures. In our country, the majority of the traditional architectural stock consists of residences. However, using traditional houses for the same function is comparatively challenging due to changes in user profiles and comfort preferences. In line with this, this study aims to propose an adaptive reuse solution for a historical wooden mansion located in the Büyükçekmece district of Istanbul. Decisions regarding the challenging usage of the existing function of the structure are made by evaluating its position with the least possible intervention. Considering location, structural condition, and land data, the mansion is evaluated for potential use as a restaurant. The proposed function is believed to not only contribute to the preservation of the structure but also add value to its surroundings. The study is particularly significant due to the structure possessing documentation and sustainability values. Additionally, it will directly contribute to the usage processes and preservation of other structures in the region.

**Keywords:** Restoration, Conservation, Adaptive reuse, Traditional house, Büyükçekmece

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# Landscape Design Project of Harput Castle (Elaziğ) and Its Surroundings

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*Nurhan KOÇAN*[2]
*Abdulsamet BAŞTEMUR*[3]

## Abstract

The study area is Harput Castle and its surroundings, located within the borders of Elazığ province. The castle is located in the southeast of Harput, on high rocks overlooking the plain. The history of settlement in Harput dates back to the times before Christ. Harput Castle carries the traces of the Urartian period. There are stairs, tunnels and waterways carved into the rocks in the castle. Harput existed only as a fortified castle until it was captured by the Turks, but with the arrival of the Turks, it became a growing city. Since Harput is located on strategically important trade routes, it has hosted various civilizations throughout history and contributed to it being an important living space. Today, Harput Castle attracts visitors, especially daily users. In the study; considering the silhouette and existing green texture of Harput Castle, an approach was developed to make the castle the main pedestrian spine of the city. In this context, planning decisions were taken to direct sub-scale applications by creating a spatial development process that will increase the quality of life and attractiveness in the center of Harput. In the conclusion, a human-centered attraction area was created, taking into account the city's living habits and urban memory, with pedestrianization and landscaping suggestions for Harput Castle. Suggestions are presented in the form of a landscape design project and three-dimensional visuals.

**Keywords:** Harput Castle (Elazığ), landscape design project, historical heritage, tourism.

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# Historical Street Rehabilitation Project of Bartin Asma Street

*Nurhan KOÇAN* [1]
*Şeyma ŞENGÜR* [2]

## Abstract

Our spaces change in terms of concrete and intangible values in line with the changing living conditions and needs from past to present. However, in recent years, the preservation of urban spaces, structures and intangible heritage that remind the memory of the city is considered an indicator of development and culture. In this context, buildings are protected and included in today's life with a change in function with their historical value, their environments and their annexes. Because that are integrate the past life to today as urban culture. In this study, Asma Street, which has been preferred as a long-standing residential area in Gölbucağı District of Bartın city center, was taken as the study area. The location of the area by the Bartın River is also a determinant of the city's water-based lifestyle. For this reason, the area is an important settlement area today as it was in the past. The area's proximity to the commercial and educational areas that constitute the locomotive of the city and to the city's important stops in terms of tourism and recreation increases the importance of the study area. In the study, the existing structure and street texture of the area were analyzed and suggestions were presented for the protection of the area by improving and developing it. In the study, three-dimensional design suggestions were presented. It is predicted that the result of the study will provide spatial satisfaction for the city, its people and visitors.

**Keywords:** Urban renovation, street rehabilitation, landscape design, Bartın.

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# Landscape Design Project of Kütahya Castle

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*Nurhan KOÇAN*[2]

## Abstract

While the castles in the cities played a role in the settlement and defense of the city in the past, the ones that have survived to the present day are important as historical heritage and are used for tourism and recreation purposes. In the study; Kütahya Castle was chosen as the subject. The fact that Kütahya is located on the transit route of the provinces of Bursa, Bilecik, Eskişehir, Afyon, Uşak, Manisa and Balıkesir will enable the castle to become a center of attraction for recreation purposes not only for Kütahya but also for the surrounding provinces, with the landscape design to be made in the castle. Because of this thought, the aim of the study was determined as the preservation and development of Kütahya Castle with its historical, cultural values and traditional texture. For this purpose, both physical, social, cultural and economic arrangements have been made completely, such as establishing a direct connection with the city, rehabilitation of historical buildings, and utilizing empty spaces in harmony with the environment. In this context, a SWOT analysis was conducted for the castle and the city as a whole, and planning decisions were made after the problems and potentials were identified. Decisions involving spatial arrangements are presented as landscape design recommendations. As a result, with the arrangement made, the preservation of the city's cultural elements and the development of socio-cultural activities will be supported, and the historical structure of the castle will be preserved and transferred to future generations.

**Keywords:** Historical castle, recreation, landscape design, Kütahya

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# Negative Effects of Light Pollution on the City and Solution Suggestions

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## Abstract

Using artificial lighting sources in the wrong amounts, choosing the wrong types, using them in the wrong directions and at the wrong time periods creates light pollution. Light pollution is an important environmental problem and must be prevented. Today, the effects of light pollution on living life have been investigated through scientific studies. Looking at scientific studies, light pollution has many negative effects on living things humans, plants, animals, etc. For example, the most important negative effect of light pollution on humans is that it affects the melatonin hormone and reduces its secretion. Melatonin hormone is the hormone that ensures sleep balance and cannot be secreted sufficiently in a bright environment. Its important negative effect on plants is that it affects plant development and flower quality. It also makes it difficult to observe astronomical events. In addition to these effects, a large part of energy consumption results from faulty and unconscious lighting applications. In this study; The negative effects of light pollution on the city and solution suggestions were researched, and the policies followed by the leading countries fighting against light pollution were examined. The adequacy of the measures taken against the negative effects of light pollution in our country has been questioned. Awareness about light pollution has increased over time in Turkey and it seems that the sensitivity about lighting has increased compared to previous years. One of the measures taken is Dark Sky Parks. It has also started to be created in our country. Regulations and implementation decisions in Turkey remained on paper, and it turned out that inspection and sanctions were not sufficient. For this reason, it has been observed that the measures taken against light pollution do not achieve the intended result.

**Keywords:** Light Pollution, Environmental Problems, Dark Sky Parks, Lighting, Glare

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# Digital Twin Technology in 3D Documentation of Cultural Heritage

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## Abstract

The most commonly used technologies for documenting cultural assets are laser scanning and photogrammetry methods, which have been the subject of many studies. Photogrammetry is a technology that allows the production of a digital twin of a building using photographs taken with certain overlapping ratios. The laser scanning method, which is the most commonly used method in documenting cultural heritage after photogrammetry, enables the creation of detailed digital twins of various structures by using a laser scanning device that basically sends laser beams and collects precise geometric data. In both methods, different sensors and different applications began to be used over time. Over time, many digital twin production technologies developed based on laser scanning and photogrammetry methods have been introduced to the market and used for various purposes. Within these systems and technologies that enable the processing of panoramic images with photogrammetric methods, LIDAR etc. for the capture of geometric data are used. Technologies that use different scanning methods have been produced. When the new generation scanning systems produced are examined, it is seen that these technologies have different advantages and disadvantages compared to photogrammetry and laser scanning methods, and thus they find users for different purposes. The Matterport system, which enables digital twin production using a LIDAR sensor, has been widely used in recent years.

Within the scope of the study, digital twins were produced using photogrammetry and Matterport systems for the III Ahmet Fountain in Istanbul. 15 different lengths determined on two different digital twins were measured. According to the results obtained, it was seen that the spatial accuracy of the digital twin produced with the LIDAR sensor was suitable for documenting cultural assets.

**Keywords:** Cultural Documentation, Digital Twin, Photogrammetry, LIDAR Sensor, 3D Modelling

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# Determination of the Optimum Route, Expropriation and Problems Encountered in Energy Transmission Lines

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## Abstract

Electricity is an indispensable source that provides convenience and comfort in fulfilling people's lives and daily activities. With rapidly growing population and continuously evolving technology, the usage of electricity and the need for electricity continue to increase. Since electricity is transmitted from the place of its generation to the place of consumption via energy transmission lines (ETL), route planning constitutes a significant stage of investments towards a sustainable energy infrastructure. Optimum energy transmission line (ETL) routes are determined using criteria such as security, geological structure, meteorological conditions, protected areas, land use and cover, topography, operational convenience, cost, ownership structure, etc. The construction of the determined route for the ETL requires the acquisition of properties. As these properties are typically privately owned with various ownership patterns, expropriation procedures under Law No. 2942 on Expropriation need to be conducted. In the acquisition of necessary properties for the establishment and operation of ETL facilities, expropriation is conducted for locations such as tower sites, transformer stations, etc., while easement rights are established for those located along the projection of overhead lines. The expropriation of privately owned properties for public benefit purposes, involving the upfront payment of compensation, is a complex and lengthy process with technical and legal dimensions that must be meticulously executed in accordance with regulations. As such, it often encounters various challenges. The problems encountered during the expropriation process for ETLs lead to an increase in the number of lawsuits, reactions from property owners, and project delays. Within the scope of this study, the expropriation process applied in the construction of ETLs in Kocasinan District of Kayseri Province is explained, including the procedural steps and the challenges encountered during the expropriation process, along with proposed solutions.

**Keywords:** Energy Transmission Line (ETL), Route determination, Expropriation, Easement, Expropriation Law

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# Documentation and Accuracy Assessment of Archaeological Sites Using UAV and Handheld Laser Scanner: Example of Ankara Roman Bath and the Ancient City

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*Aydan YAMAN*[2]

## Abstract

It is of great importance to examine and record historical remains and artifacts in order to have information about the social, cultural, economic, political, etc. experiences of societies in the historical process. These ruins and artifact contribute to the correct planning of the future as well as the experiences that people have accumulated throughout history. Documenting the cultural heritage will ensure accurate recording of these artefacts preventing future damage and extinction. Documentation methods are as important as archaeological site documentation. In archaeological studies, images that can provide sufficient accuracy for such sites at a given distance and that can be acquired quickly are often needed. Documentation work in these areas is made easier, more precise, more economical and in a shorter time thanks to the new techniques used in recent years. Today, there has been a shift from traditional data collection methods to more practical and accurate methods such as laser scanners and unmanned aerial vehicles (UAVs). These methods allow the acquisition of a substantial amount of data pertaining to the historical building, with an acceptable degree of precision, without any physical contact with the building itself. The utilisation of a variety of software enables the generation of digital data and three-dimensional (3D) models of the object in question. Within the scope of the study, both UAV and handheld laser scanner were used in the study area. In this context, first, an orthophoto of the study area was produced by flying from two different heights with a UAV, then a 3D model of the same area was obtained with a handheld laser scanner and the accuracy of the results were compared.

**Keywords:** Accuracy, Archaeological sites, Documentation, Handheld laser scanner, Unmanned aerial vehicle

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# Production of Current Maps with Unmanned Aerial Vehicle (UAV) and Terrestrial Measurement Method and Examination of Accuracy Analysis: Example of Batman Province, Şirinevler District, Urban Transformation Zone

*Veysel YILDIZ*[1]
*Aydan YAMAN*[2]

## Abstract

Unmanned aerial vehicles (UAVs) are vehicles that lack a pilot or passenger, carry only equipment appropriate to the intended purpose (e.g. a video camera, camera, GNSS, laser scanning device, etc.), and have the capacity to fly either remotely or automatically. Data acquisition, which in the past required time and cost, can now be done more easily, quickly and practically with the development of technology. As in many fields, data collection is an important process in engineering studies. In this context, UAVs provide low-cost, fast and high-precision data. Geometric accuracy and precision in orthophoto maps used in applications related to geomatics activities are very important. In the study, Şirinevler District, Urban Transformation Zone, located in Batman Province, was selected as the study area. Data such as high-resolution orthophoto map of the study area, digital elevation model, and point cloud were produced in Pix4D software. In addition, the current map production process was carried out in NetCAD software. Thus, in the study area, current maps were produced using both UAV and terrestrial measurement techniques, accuracy research was carried out, and the advantages of both methods and the resulting accuracy were compared. As a result, it has been seen that the use of UAV provides sufficient accuracy in the production of current maps in accordance with the regulation (BÖHHBÜY) and provides advantages in terms of time and cost.

**Keywords:** Accuracy, Current map, Orthophoto, Terrestrial measurement techniques, Unmanned aerial vehicles

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# Characteristics of Hydrothermal Alterations in Kitreli (Niğde) Geothermal Field

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## Abstract

This study aims to reveal the characteristics of hydrothermal alteration by investigating the geological, mineralogical and geochemical properties of hydrothermal alterations that occur in the Kitreli (Niğde) geothermal field. The Kitreli geothermal field is based on the Melendizdağı andesite. These andesitic rocks are intruded by younger aged basalts. The youngest units are slope rubble and alluvium. The general mineralogical composition of the thin section studies is quartz, plagioclase, orthoclase, amphibole, pyroxene, opaque minerals and volcanic glass. The samples taken from the geothermal field were subjected to advanced alteration such as iron oxidation, sericitization, and silicification due to the proximity to the potential hot spring. According to X-Ray Diffraction (XRD) analysis results, the most typical alteration mineral is jarosite mineral. Jarosite mineral was formed by the rise of fluid in fractures and cracks and alteration of volcanic rocks. In X-Ray Fluorescence (XRF) analysis results, the existence of jarosite minerals is indicated by the excess of sulfate in the samples. Considering the geology and tectonics of the study area, surface alterations and hydrothermal alteration minerals are compatible with each other. These analyses and results reveal the mineralogical, petrographic and geochemical characteristics of hydrothermal alteration in the rocks of the Kitreli region.

**Keywords:** Hydrothermal alteration, Geothermal, X-Ray Fluorescence (XRF), X-Ray Diffraction (XRD), Kitreli

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# Determination of surface water flow direction using GIS methods in the Yesiloz (Nevsehir) basin

*İlknur DEMİRCİOĞLU*[1]

## Abstract

The study area is geographically located in Central Anatolia, geologically on the Central Anatolian crystalline complex, and according to some researchers, on the region called the Kırşehir massif. The study area in the north of Avanos district of Nevsehir province covers the graben areas within the horst-graben structure formed during the neotectonic period, starting in the Late Miocene-Pliocene period. In these areas, the basement rocks are Palaeozoic-Mesozoic-aged metamorphites. These units were covered by sedimentary and volcanic rocks of late Palaeocene-Quaternary age. The basement metamorphic and igneous rocks are faulted and multi-fractured due to multi-stage deformations in the region. The multi-fractured sections observed in these rocks constitute the aquifers. Pebble and sandstone levels in sedimentary rocks form aquifers. Fractured sections in sedimentary and volcanic rocks constitute secondary aquifers.This study evaluated hydrogeological data using geographic information systems (GIS). Accordingly, the direction of groundwater flow in the basin was determined by using the drilling data in this area, and it was found that it is from northeast to southwest, and the groundwater feeds the Kızılırmak River. By using the Arc-GIS programme, the surface water flow direction was determined, and it was found that it is from northeast to southwest and towards Kızılırmak. Groundwater flow directions and surface water flow directions are compatible with each other.

**Keywords:**Nevşehir, Yeşilöz basin, Hydrogeology, GIS, flow direction.

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# Visual Slam Applications in Autonomous Mobile Robots

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## Abstract

Mobile robots have made significant progress in the past decades, and their use has become widespread in a wide range of areas, from production to logistics, from aviation to military areas, from the service sector to homes. Position estimation and simultaneous mapping are solved using SLAM techniques so that mobile robots can perform tasks in an unfamiliar environment. In this context, the visual SLAM technique was born with the idea of using cameras instead of the traditional SLAM method used. The advantages of the visual SLAM technique, such as low-cost sensors and intense environmental information, have attracted researchers to this field in recent years, and developments have been made on various algorithms and techniques. Although the developed methods have achieved serious success, there are still problems that need to be solved. Among these problems, there are many external factors that affect the performance of Visual SLAM algorithms. There are many factors such as the lighting of the environment, the texture and structural features of the surrounding objects, the speed and sudden harsh maneuvers of the system, crowded and dynamic environments.
In this study, in order to increase V-SLAM performance, image enhancement was carried out with an emphasis on ambient lighting and image lighting algorithms for low-light environments. System performances and efficiencies of the algorithms were compared on a platform designed with algorithms that have achieved good results in the literature. In this context, the algorithms and camera sensors used were evaluated with error metrics such as global optimization performances, loop closure detection used to correct the error accumulated during robot movement, absolute orbit error and relative position error. In the future, it is planned to integrate deep learning algorithms for V-SLAM and focus on studies on semantic-based approaches.
**Keywords:** Visual SLAM, Localization, Mobile Robots, Navigation, Mapping.

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# Analysing the contribution of the number of elbows to emissions in buildings using natural gas

*Ahmet KARAHAN*[1]
*Figen BALO*[2]

## Abstract

Emissions released from building chimneys play an important role in environmental pollution. Many methods are applied to reduce emissions in order to reduce environmental pollution. One of these methods is the technical arrangements that can be made in chimney designs. Correct chimney design should be made by taking many factors into consideration. Among these factors, there are many issues that need to be taken into consideration, such as the insulation of the chimney, its structure, temperature and pressure differences close to the standard for the chimney, the climatic conditions of the city where the chimney is designed, and the characteristics of the building where the chimney is used. The number of elbows used in chimney design is one of the factors affecting the traction power of the chimney, its performance, the amount of energy resource usage and the amount of emissions released into the environment. Elbows used as fittings are pipe fittings that are widely used in pipe systems, mostly to change the circulation direction of the pipeline. Pipe elbows have industrial standards. It has limitations such as angle, test, size, material, bend radius. Pipe elbows are connection elements that do not have a standard number of uses and are generally used in different numbers depending on the needs of the pipes where they are used.

Detailed calculations that must be made using many complex equations and tables for standard-compliant chimney calculations are time-consuming, long, difficult and impractical. In order to create healthier chimney designs, calculations made using software that has been implemented and accepted by many countries recently are becoming more accepted both in terms of creating energy efficient buildings and controlling environmental pollution.

In this study, the contribution of the number of elbows to emissions in buildings using natural gas was investigated using the Kesa Aladin software, which is produced in Germany and can make calculations according to the standards accepted in all European countries. For this purpose, it was tried to determine the amount of emissions released into the environment in the case of chimneys designed in circular and oval types using stainless steel for a natural gas boiler with a capacity of 225 000 kcal/h in a building located in Gümüşhane province, without elbows, with one pole, with two elbows and with three elbows. In addition, chimney diameter comparison results were made to scan the results of the variable comparison situation in the designed chimneys according to the standards, and with the help of the analysis results obtained, the chimney performances were evaluated in terms of correct design outputs and environmental aspects. The results obtained are intended to give ideas to designers and environmentalists on the subject.

**Keywords:** Chimney design, Environmental pollution, Boiler, Energy efficiency, KesaAladin software

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*Figen BALO*[2]

## Abstract

Emissions released from building chimneys play an important role in environmental pollution. Many methods are applied to reduce emissions in order to reduce environmental pollution. One of these methods is the technical arrangements that can be made in chimney designs. Correct chimney design should be made by taking many factors into consideration. Among these factors, there are many issues that need to be taken into consideration, such as the insulation of the chimney, its structure, temperature and pressure differences close to the standard for the chimney, the climatic conditions of the city where the chimney is designed, and the characteristics of the building where the chimney is used. The number of elbows used in chimney design is one of the factors affecting the traction power of the chimney, its performance, the amount of energy resource usage and the amount of emissions released into the environment. Elbows used as fittings are pipe fittings that are widely used in pipe systems, mostly to change the circulation direction of the pipeline. Pipe elbows have industrial standards. It has limitations such as angle, test, size, material, bend radius. Pipe elbows are connection elements that do not have a standard number of uses and are generally used in different numbers depending on the needs of the pipes where they are used.

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**Keywords:** Chimney design, Environmental pollution, Boiler, Energy efficiency, KesaAladin software

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# Determination of Scattering Parameters in Horn Antenna Design Using Machine Learning Algorithm

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## Abstract

The horn antenna structure used in wireless communication systems provides data transmission in wide frequency spectrums and achieves high efficiency while doing so. Designing this antenna structure is of great importance in optimizing the performance of the communication system. Scattering parameter, which is an important characteristic feature in antenna design, is one of the important factors that determine the efficiency of the antenna. This study has introduced a machine learning model that can predict the scattering parameter, which largely determines the efficiency of the system during transmission in the horn antenna, by making use of the antenna's features such as radius, cone height, Aperture Radius, Waveguide Height, feed height, feed Width, feed offset and frequency value. The XGBoost model developed for the study is a machine learning algorithm and an ensemble learning method. Due to its structure, the algorithm used is based on the combination of many weak learners to form a strong learning system, thus creating a learning community. Thanks to this model, the efficiency to be achieved in the planned communication system can be determined in advance and the system can be optimized for the best. This model was implemented with the Python programming language via Anaconda's SPYDER IDE and demonstrated the use and benefit of artificial intelligence algorithms in antenna design in the field of communication.

**Keywords**: XGBoost, machine learning, wireless communication

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# Grouping of Provinces in Turkey Under Environmental Indicators with Cluster Analysis

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*Hasan BULUT*[2]

## Abstract

The environment is generally defined as common living spaces where all living things interact and have a relationship. Nowadays, environmental problems are gaining momentum in parallel with the growth rate of the human population and degeneration of the environment negatively affects both human health and other living populations. To offer the world population a sustainable life in a clean nature in the future, international conferences, including Turkey, are organized, and solutions to environmental problems and polluted natural resources are sought in these conferences. On a national scale, studies are carried out at regular intervals by the Turkish Statistical Institute (TSI) and the Ministry of Environment, Urbanization and Climate Change, and publications containing environmental indicators are presented to the public. Environmental indicators shed light on decision makers in analyzing the current situation and creating environmental policies. When the literature is reviewed, it is observed that there are very few publications comparing the provinces in Turkey using environmental parameters. The purpose of this study is twofold: To analyze the provinces in Turkey by comparing them under environmental parameters and to cluster the provinces with similar structures with cluster analysis in order to contribute to the development of common strategies. Cluster analysis can be defined as a collection of methods that group observations so that they are homogeneous within clusters and heterogeneous between clusters. In the study, 11 variables obtained from the Municipal Water, Municipal Wastewater and Municipal Waste Statistics, which the Turkish Statistical Institute carried out the field study in 2023 and announced the results, were taken into account and the average linkage method, which is among the hierarchical clustering techniques, was used in the clustering of the provinces. Cluster validity indices led to the determination of the number of clusters and the clustering method. As a result of the analysis, the number of clusters was determined as 2. When the provinces are divided into two clusters, there is only Istanbul province in the first cluster, while there are the remaining 80 provinces in the second cluster. Data analysis was carried out using the R Studio program.
**Keywords :** Average Connection Method, Clustering Analysis , Cluster Validity Indexes, Kofenetik Correlation Coefficient , R Programming

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# Evaluatıon Of The Crıterıa Requıred For Waste Selectıon Usıng The Ahp Method

*Oğuzhan TURAN*[1]
*Mehmet Kaan TEMİZ*[2]
*Hasan Bilgehan KAPLAN*[3]
*Mehmet PINARBAŞI*[4]

## Abstract

Substances that are no longer needed by the process as a result of product or service production, cannot be used and must be removed from the process are called waste. If waste is not disposed of in any way, major environmental problems may occur. Although wastes are generally classified as solid, liquid and gas according to their production, chemical and physical properties, there are many types of waste in the engineering sense. Wastes are included in disposal or reuse processes according to their types. In order to use waste in these processes, the appropriate waste must be selected. Production facilities must remove waste generated during production processes from their systems both technically and legally. In this regard, facilities cooperate with some waste contractor companies. This study focuses on the problem of how a waste contractor company should decide whether to load a waste or not. The aim is for the contractor company to create a more efficient and effective waste selection process. It was studied to determine the criteria required to select the appropriate waste among the many types of waste that reach a contractor company. Although contractor companies tend to choose the wastes that will make the most profit, many criteria such as supply continuity, poison rate, water rate and calorific value of the relevant waste are also effective in the acceptance of the waste by the contractor. For this reason, many criteria will be effective on the contractor's waste selection. In this study, the criteria affecting waste selection were evaluated with the Analytical Hierarchy Process (AHP) method, which is a multi-criteria decision-making technique. 12 criteria affecting waste selection were determined using the group decision-making technique with experts. In the analytical evaluations, it was seen that the unit sales price criterion of waste was the criterion that had the most impact on waste selection, while the test cost criterion was the least effective criterion.

**Keywords:** : Waste Selection, Selection Criteria, Multi Criteria Decision Making, Analytical Hierarchy Process

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# Optimization by Response Surface Method for Determination of Antioxidant Mixture Ratios Used in Poultry Fat Production in Rendering Plant

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*Kıvılcım ATEŞ*[2]
*Ömer YILMAZ*[3]

## Abstract

There is a need for a rendering process to process the wastes generated in chicken slaughterhouses. This process processes wastes such as feathers, blood, intestines and heads into value-added products such as chicken meal, poultry fat and blood meal. Rendering products are used as animal protein source in animal feed. In chicken slaughterhouses with rendering process, different antioxidants need to be used in different mixtures to prevent fat oxidation in poultry fat and to maintain oil quality. Peroxide value in poultry fat is the most important quality characteristic. In this study, peroxide number and cost optimisation in poultry fat were studied. For this purpose, butylated hydroxyanoside (BHA) and butylated hydroxytoluene (BHT) antioxidant parameters were optimised in the poultry fat production process in order to obtain cost and peroxide number values within the desired range in a company producing poultry fat in rendering plant. For the purpose of process design, experiments were designed for different combinations of factor levels ranging from 0.1-0.15 kg BHA and 0.2-0.25 BHT and cost and peroxide number measurements were carried out on the products. For the experimental design, response surface methodology is used. Then, using the experimental results obtained, mathematical relationships between inputs (BHA and BHT) and outputs (Cost and Peroxide Analysis) were found with the help of Minitab statistical analysis program and statistical analyses were performed. The $R^2$ values for the regression models are calculated as 86.23% and 87.54% for BHA and BHT, respectively. The ANOVA results are indicated that the both models are significant. Finally, optimisation was performed with the help of Minitab program and the optimum process parameters were found as 0.10 kg BHA and 0.20 kg BHT.

**Keywords:** Poultry fat, peroxide analysis, response surface method, optimization, antioxidants.

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# Simulating Sea Ice in LS-Dyna Using Finite Element Method and Comparison with Previous Studies

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## Abstract

Offshore operations and maritime transportation have given priority to some pursuits in the field of shipping. In particular, it has raised the questions of reducing the use of fossil fuels and how to make ice-covered routes in the northern regions useful. Ships designed to navigate safely in these cold regions must have superior resistance to ice. Therefore, using shipping lanes efficiently and removing ice from being an obstacle is calculated using numerical ice models. The properties of numerical ice models play a critical role in the design of these structures and should therefore be studied in detail. This study comprehensively simulates the microstructural features of real sea ice, including air bubbles, ice crystals and brine pockets. Digital ice has been modeled as very similar to natural sea ice, with its inhomogeneous structure and complex damage mechanisms. In these simulations, basic mechanical properties such as grain size, elastic modulus, Poisson's ratio and strength under pressure were carefully determined experimentally. The parameters of the numerical model were adjusted using experimental results and reverse engineering techniques, thus ensuring a high agreement between numerical and experimental data. The breaking stresses of the model were verified by comparing them with the strength values obtained in the laboratory. This advanced model may find wide use in the near future for the development of economical and simulation-based designs of marine structures and their effective evaluation before the testing phases.

**Keywords:** Ice-structure ineraction, crushing, ice behavior

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# Optimal Roll Motion Control with Active Fins Based on Force Superposition Method

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## Abstract

Marine vessels are designed to ensure sufficient reliability with the most suitable economic values. Controlling the ship's motion is essential to achieve this design goal. In this study, the ship motion component to be controlled is selected as roll motion. A model ship is created based on the gulet type vessel, with the data acquired using this model ship, a single-degree-of-freedom nonlinear equation of motion model is developed according to the force superposition method. The white noise of the wave spectrum, roll motion of the ship is caused by the wave moment, is passed through a linear filter to obtain frequency, damping ratio, and power spectral density. The damping components of the system are calculated by solving the convolution integral with the Cummins equation. Subsequently, an LQR controller is designed to operate two active fin stabilizers that were located at starboard and port amidship to control roll motion, velocity, and acceleration. By solving both uncontrolled and controlled systems, roll motion and velocity values are obtained and a comparison is made to assess the performance of the system. In addition, the responses of the system for different fin stabilizer constraints were examined. Throughout the simulation, it is assumed that the ship's forward speed is constant, and the analyses are performed in the time domain.

**Keywords**: Roll Motion, Force Superposition Model, LQR Controller, Fin Stabilizers, Wave Spectrum

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# Time and Project Management in New Shipbuilding

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## Abstract

A significant portion of global trade is conducted via ships, which also play vital roles in security, research, exploration, production, storage, food supply, tourism, and entertainment. The growing demand in the global market, changes in emission regulations, and increasing security needs are driving the demand for various types of ships. Despite many standards and studies in project management, there is a notable lack of research focused on new shipbuilding, which involves non-serial production and numerous activities such as steel cutting, block erections, ship launching, start-up, quay, and sea trials. New shipbuilding is a complex manufacturing process that requires effective project management and precise time management to determine project success. Theoretically the new shipbuilding process is an engineering-to-order process and includes with huge number of activities on various fields. This interdisciplinary field encompasses supply chain management, manufacturing methods, human resources, production methodology, material science, electricity, electronics, machinery, health and safety, and a market that evolves with advancing technology. The process includes not only time and project management, but also team and stakeholder management including various people from different cultures and backgrounds. It is possible to call the shipyards as an integrator; that is why the great coordination ability is also needed for the new ship building. Therefore, examining literature related to these factors is crucial for understanding and improving project management in new shipbuilding.

**Keywords**: New shipbuilding, project management, time management, project and time management, supply chain management, risk monitoring, stakeholder coordination.

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# Evaluation of the Anti-tyrosinase Activity of Triarylbenzophenone and Sulforaphane Analogues with Potential Use in Treating Hyperpigmentation

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*Tugba B. TUMER*[1*]

## Abstract

Skin hyperpigmentation results from overproduction of melanin biosynthesis occurring in melanocytes within the basal epidermis. Tyrosinase, which is associated with melanin biosynthesis, is a copper-containing monooxygenase responsible for catalyzing melanin synthesis in melanocytes. High concentration of melanocytes induces reactive oxygen species (ROS), increasing the formation of tyrosinase enzyme and causing hyperpigmentation disorder in the skin. Therefore down-regulation or inhibition of tyrosinase activity is important to deal with pigmentation disorder. In this study, the effects of our compounds, Triarylbenzophenone derivative compounds, synthesized by organic methods from Selaginella pulvinata and Sulforaphane derivative compounds from Isothiocyanates (ITC) that attracting attention with their unique structures, on the tyrosinase enzyme were investigated. As a result of the study, a low inhibition of 92.47% and 83.89% was observed at 50 and 100 µM doses of the triarylbenzophenone derivative compound, while 50% inhibition was found at 50 µM and 100 µM doses of the sulforaphane derivative compounds named I1, I2, I1-C and I1-E. In particular, over 50% inhibition was found at 50 µM and 100 µM doses of the sulforaphane derivative compounds named I1, I2, I1-C and I1-E. These compounds presented an inhibitory effect that was 4.12 and 3.11 times more potent than kojic acid as a standard inhibitor. The discovery of anti-tyrosinase agents of natural origin will enable the development of effective applications with low side effects in the pharmaceutical and cosmetic industries. Therefore, the results obtained will contribute to the development of new lead compounds that suppress excessive melanin production in the skin and can be used in the treatment of many diseases caused by hyperpigmentation.

**Keywords**: *Triarylbenzophenone, Sulforaphane derivatives, anti-tyrosinase activity, hyperpigmentation, lead compounds*

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# Various Bifidobacterial Enzymes and Their Activities

*Sercan KARAV*[1]

## Abstract

Glycosylation stands out as a crucial and widespread posttranslational alteration, leading to a broad spectrum of protein configurations, as more than half of eukaryotic proteins adopt glycosylated states. Glycosylated glycans are capable of a broad variety of biological activities inside cellular settings. Understanding the functions of glycans in biological processes depends critically on the identification and characterization of novel glycosidases, as alternative deglycosylation techniques have limitations. In our previous research, we successfully produced three new Bifidobacterial glycosidases: OU11_RS07620 from *Bifidobacterium pullorum subsp. pullorum*, BBKW_1881 from *Bifidobacterium kashiwanohense*, and BBOH_0438 from *Bifidobacterium bohemicum*. In this current study, we evaluated the enzymatic activities of these newly identified enzymes using the model protein Rnase B. Additionally, the optimal pH and temperature conditions for each enzyme were determined and conducted a thorough analysis of their kinetic constants using a protein mixture substrate. The released *N*-glycans were quantified using a phenol-sulfuric total carbohydrate assay, and the resulting *N*-glycan structures were analyzed using MALDI-(TOF)/TOF-MS. Additionally, comparative three-dimensional models of the enzymes were generated and assessed. Based on the kinetic parameter results obtained from the model glycoprotein substrate solution, *Km* values ranged from 3.44 to 7.18 mg/mL, and *Vmax* values ranged from 2.29 x $10^{-2}$ to 2.52 x $10^{-2}$ mg/mL×min, respectively, for the three novel glycosidases. The structural analysis and kinetic properties of the released glycans suggest that these new glycosidases may facilitate the large-scale release of bioactive and complicated glycans from a variety of glycoprotein substrates. These results also suggest that whey, which is often considered a waste product, may actually be a good source of prebiotic *N*-glycans.

**Keywords:** Deglycosylation, *N*-glycans, Endo-*β*-*N*-acetylglucosaminidase, Enzyme Kinetics

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# Improved Digestibility and Bifidogenicity by Deglycosylation

*Sercan KARAV*[1]

## Abstract

Glycosidase enzymes, with their ability to catalyze the hydrolysis of glycosidic bonds, play a crucial role in breaking down complex carbohydrates. Recent studies indicate that by concentrating on glycosidic bonds within protein structures, these enzymes may also have a substantial impact on the digestion of proteins. Through this enzymatic action, glycosidases facilitate the release of peptides and amino acids, thereby enhancing protein digestibility. Furthermore, there is growing evidence that glycosidase activity contributes to a bifidogenic environment that supports gut health by encouraging the selective growth of Bifidobacteria in the gut microbiota.

From this perspective, the digestibility and bifidogenic properties of lactoferrin proteins with different glycosylation profiles obtained by treatment with novel microbiome-derived enzymes were tested. The effects of different glycan profiles (high mannose, hybrid, complex types acidic, and neutral) obtained through various specificity glycosidase enzymes to the protein digestibility and bifidogenic properties of lactoferrin glycoprotein with a wide spectrum of glycan profiles has been elucidated. Different Bifidobacterium strains (*B. infantis, B. bifidum, B. breve, and B. lactis*) were used to determine the bifidogenic effect of various lactoferrin samples, and the results were calculated as a percentage of bifidogenic effect compared to the positive control sample. According to the obtained data, no bifidogenic effect was observed on B. lactis due to its lack of glycan metabolism. However, it was observed that the glycans separated from lactoferrin had a high bifidogenic effect on B. infantis (17.65%-18.50%), B. bifidum (15.30%-15.55%), and B. breve (12.50%-12.80%) bacteria. When the experiment data for calculating digestibility rate was examined densitometrically, it was concluded that deglycosylated lactoferrins with different glycan profiles (1.31%-75%) were digested more rapidly compared to native form of lactoferrin.

**Keywords:** Glycosidases, Digestibility, Bifidogenicity, Lactoferrin.

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# On Similarity and Poloid

*Hasan KELEŞ*[1]

## Abstract

This study is about similarity and poloid. Some properties of these two structures, which have common features, are investigated. A monoid is the smallest structure of a group structure. In this smallest structure, all elements have inverse. These inverse elements are only one. The poloid is a new concept. A poloid is a small expansion of a monoid. All elements have inverse in monoid. At the same time, in this poloid structure, each element is a product of three elements, at least one of which is common and two of which are different. That is, A=BP=PC, where B≠C. The concept of similarity is used in matrices. An example of a poloid is the structure of regular matrices. The concept of similarity is used in matrices. Many application areas of similar matrices are possible. An example of a poloid is the structure of regular matrices. This situation is the intersection point for the two topics. This idea is the main idea of the study. The structure is analysed again for similar mantrices in the target. Known properties, lemmas, theorems are explained. This information and the definition of poloid, lemmas and theorems belonging to poloid are provided new contributions to the study. The definition of similarity of poloid structure is given. Poloid structure related to similarity is analysed. New lemmas about similarity are given by using the transitivity property of the poloid. Different approaches to the application areas of similarity are gained. This investigation is theoretical. There are some approaches for application areas.
**Keywords:** Monoid, poloid, matrices, regular, division.

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# On The Basic Structure of Logic B3

*Hasan KELEŞ*[1]

## Abstract

This study is first done on the enrichment of formal logic on a monoid. Here, new features, definitions, lemmas and propositions gained with the enrichment of logic are examined. Emphasis is placed on enriched structures. Additional developments in the usage areas of known structures are discussed. The connections of algebraic structures with power sets are examined. The main principle that algebraic structures add to the science of logic is discussed. The existence of new logical structures is investigated. The results of this new logical algorithm are evaluated. Comparisons are made with previously known algorithms. The structure is built on the set of solutions of some equations in the set of real numbers. The solution set of the equation xx is composed of idempotent elements and the solution set of the equation xxx is composed of ternary elements. Boolean is formed binary logic from Arthur's idempotent elements. Binary logic is developed further today and created a digital field for itself. This widening of the field is also created some power problems. The problems are not initially physical problems. Different requirements are needed as the areas of use increased or as they are put into the service of humanity. This is contributed to the formation of triple logic. The material used by our mind in binary logic is two. This number is one more in ternary logic from binary logic. This situation is led to the acquisition of more skills in fewer operations. This structure is offered a solution for social structures. The use of the structure is likely to become widespread as humanity needs.

**Keywords:** Binary, ternary, logic, basic, idempotent, trempotent.

Hasan Keleş, Öğretim Görevlisi, Karadeniz Technical Üniversity, Department of Mathematics

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# Mineralogic Assessment of Natural Radionuclide Rich Beach Sands in Western Anatolia (çanakkale)

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## Abstract

Natural radioactivity concentrations in beach deposits and surrounding magmatic rocks at Ezine, Çanakkale, are notably high. The specific activities of $^{238}U$, $^{232}Th$ and $^{40}K$ are in the range of 40-361, 50-341 and 670-1572 Bq $kg^{-1}$, respectively, for the magmatic rock suites. Bulk sand samples from the beaches exhibit even higher concentrations of natural radioactivity: Hantepe beach, located near the contact of Kestanbol pluton with pre-Tertiary basement units displays extremely high $^{238}U$ (1885 Bq $kg^{-1}$) and $^{232}Th$ (4360 Bq $kg^{-1}$) with the lowest $^{40}K$ (687 Bq $kg^{-1}$) activity concentrations.

This enrichment at Hantepe beach was attributed to the U-bearing accessory minerals (zircon, apatite, thorite, uranothorite, monazite, etc.) selectively rich along the northern margin of Kestanbol Pluton. These minerals serve as Rare Earth Elements (REE) repositories, prompting an extensive investigation into the economic potential of radionuclide-rich beach sands at Ezine.

In this study, gamma ray spectrometry measurements were conducted on fractions of beach sands to identify the source minerals of the radioactivity. The sand fraction concentrated in diamagnetic and felsic minerals (K-feldspar + Plagioclase ± Quartz) with grain sizes ≥ 250 µ, exhibits the highest $^{40}K$ specific activity (1173.3 ± 133.5 Bq $kg^{-1}$) but the lowest concentrations of $^{238}U$ (176.4 ± 18.1 Bq $kg^{-1}$) and $^{232}Th$ series (197.8 ± 21.9 Bq $kg^{-1}$). On the contrary, the fraction rich in paramagnetic and mafic minerals (Pyroxene + Amphibole + Biotite + Epidote ± Granat) with the grain sizes < 125 µm has the most elevated concentrations of $^{238}U$ (884.5 ± 56.6 Bq $kg^{-1}$) and $^{232}Th$ (1332.9 ± 99.1 Bq $kg^{-1}$) series and slightly elevated $^{40}K$ (436.4 ± 50.3 Bq $kg^{-1}$), compared to the Earth's average. These findings suggest that the rock-forming minerals in the magmatic rocks are also responsible for the natural high radioactivity in the region.

**Keywords:** Natural radioactivity, Beach Sands, Magmatic Rocks, Rare Earth Elements, Gamma-Spectroscopy

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# The Late Last Glacial-Holocene Paleoclimate Variability of the Gediz Graben (Western Türkiye): Insights from the Results of Paleoclimate Models and Fossil Pollen Analysis

*Mesut KOLBÜKEN*[1]
*Demet BİLTEKİN*[1]
*Bülent ARIKAN*[1]

## Abstract

The Gediz Graben has been an attractive area for human occupation due to its suitable geographical features such as the large arable land coupled with water sources that supported animals and plants attracted human groups and societies at different archaeological periods. The Gediz Graben is located in a transition zone between polar (in winter) and tropical circulation (in summer) systems which also makes the region highly sensitive to climatic changes. This research aims to reconstruct paleoclimate dynamics of the Gediz Graben since the late Last Glacial covering the last 21 ka by using a multiple approach through different paleoclimate models (the Macrophysical Climate Model and CHELSA-TraCE21k) and a new palynological record from core MAR03-02C in the Aegean Sea.

Based on the results of the paleoclimate models, in the late Last Glacial Period and the early Holocene, the climatic conditions of the graben were wetter (except paleoprecipitation of the CHELSA-TraCE21k) and colder than today. During the middle and late Holocene, the climate was generally stable, and near-modern patterns prevailed around 7 ka in the graben while the climatic shifts occurred at smaller amplitudes for shorter time periods in comparison to the previous periods. This pattern was recorded in variations in Mediterranean/temperate forests and herb/steppe plants. In the cold and dry late Last Glacial Period, low amounts of arboreal pollen and high percentages of cold/drought-tolerant Pinus and Cedrus trees with high amounts of herbaceous and steppe pollen, including Artemisia, Cyperaceae, and Asteraceae Cichorioideae were recorded. Warm-temperate and Mediterranean trees, consisting of mainly deciduous Quercus and Quercus ilex-type trees, reached their maximum from the onset of the Holocene at ~11.7 to 6 ka, corresponding to the Holocene Climate Optimum. Subsequently, general aridity trends and nearly modern climate patterns prevailed. Variations in the paleovegetation, the paleoprecipitation and paleotemperature patterns indicate major climatic shifts associated with the changes in the North Atlantic Region. In Gediz Graben, the patterns from the paleoclimate models and the palynological record show similarity with local and regional proxy data in the eastern Mediterranean.

**Keywords:** Paleoclimate, Gediz Graben, Fossil Pollen Analysis, Late Last Gacial Period, Holocene

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# A PESTEL Analysis on Autonomous Vehicle Technologies in Türkiye

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## Abstract

Autonomous vehicles continue to be a very popular topic worldwide. Countries are conducting many academic and commercial studies on hardware and software in order to be a pioneer in new autonomous vehicle technologies and to achieve full autonomy level (Level: 5 Autonomous Driving). Countries are also creating road maps and continuing to work on providing appropriate infrastructure and smart city planning for vehicles that will have this technology in the future. Türkiye has many start-ups and initiatives developing technology for autonomous vehicles. However, autonomous vehicles cannot yet be actively used on Türkiye's highways and autonomous vehicles cannot become widespread. In Türkiye, there is a need to improve all the necessary infrastructure and to plan and work to ensure regulatory requirements. In this regard, there is a need to conduct a current situation analysis specific to Türkiye. The PESTEL analysis method is used as a useful tool that contributes to strategic management by evaluating external factors that may affect the business line in which firms operate. In PESTEL analysis, the current situation is analyzed from political, economic, social, technological, environmental and legal aspects. By analyzing these factors, the company in the selected field can identify potential opportunities and threats and adjust its strategy accordingly. In this paper, Türkiye's current situation on autonomous vehicle technologies is analyzed using the PESTEL analysis method.

**Keywords:** Autonomous Vehicles, Autonomous Technologies, Automotive, PESTEL Analysis

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# Start-ups Collaboration Process Management for Companies

*Mehmet Oğuz Gazi*[1]

## Abstract

To ensure the sustainability of companies, innovation, research, and development activities are of great importance. When we look at innovation strategies in the literature, we can categorize innovation for companies into four main headings: market penetration strategy, market development strategy, product development strategy, and diversification strategy. When considering these four main headings, market penetration strategy, which is routine innovation, stands out as an easily applicable innovation strategy for large-scale companies. However, by nature, start-ups have more advantages for implementing the other three innovation strategies compared to large-scale companies. Therefore, strategic collaborations with start-ups are crucial for large-scale companies to realize innovations that can lead to new products, new markets, and competitive advantages. Therefore, it is essential to manage collaborations with start-ups properly. The management of start-up collaboration processes should embrace a "we" approach, where start-ups and corporations are on the same side, rather than the traditional customer - supplier relationship. Research shows that feedback provided by large-scale companies to start-ups positively contributes to the development curve of start-ups due to start-ups' agile working and quick decision-making capabilities. The visualized results of this symbiotic relationship, beneficial for both parties, may not always be immediately evident in the short term. Therefore, in companies, it is crucial to establish the right performance and activity indicators when managing start-up collaboration and open innovation processes. Proper reporting of these performance and activity indicators positively influences decision-makers' decisions regarding start-up collaboration processes. This study aims to define, manage, and detail the roadmap for corporate start-up collaboration processes.

**Keywords:** Innovation, Start-ups, Strategy, Technology

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# A Bunch Of Geography

*Halil Mesut BAYLAK*[1]

## Abstract

The opportunities offered by technology provide qualified contributions to education and training. It creates new areas that can be used in teaching activities. Developments in science and technology, which allow rapid access to information and presentation in different formats, have enabled course content to be delivered as a fun time activity using computer technologies. Lifelong learning environments need to be adapted to the changing game culture and used as an educational tool that can take place at any time in any environment and tool. For this purpose, there is a need to create a complementary solution proposal offered by technology in the light of modern developments, in order to popularize the active use of Geography subjects in applications for which technology is designed. By analyzing the findings resulting from the survey-based research, a strategy for adapting to technology and designing an understanding appropriate to it was determined, and geography games described as "A Bunch of Geography" were prepared. Depending on technological developments, it is aimed to create an application proposal to present digital elements as harmless virtual environment applications. With the project, computer games with course content that can be developed to learn geography subjects in the social studies course curriculum by using digital game types and create entertaining course content, allowing additions to be made as needed, have been created.

**Keywords:** Geography, Technology, Design Editing, Game with Lesson content.

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# The Effect of the Use of Single Row and Double Row Umbrella on Surface Settlements in the Fortitication of Shallow Tunnels: Dudullu-Bostancı Metro Line Passenger Tunnel Example

*İnci Nur ÇAKAR*[1]
*Murat Ergenokon SELÇUK*[2]

## Abstract

In urban tunneling, especially in the increasingly common design and construction processes of metro systems, shallow tunnels are frequently encountered in the design and construction of passenger tunnels connecting both ends to facilitate surface exits as well as pedestrian crossings. Deep excavations in metro constructions, depending on the thickness of the remaining ground cover, may also be referred to as shallow tunnels within tunnels constructed using mechanical or machine excavation methods.
In tunnel systems, the thicker the cover thickness above the tunnel, the easier it is for the tunnel section to achieve equilibrium due to the arching effect. Additionally, as excavation goes deeper into the ground, an increase in the values of the strength parameters of the ground unit intended for tunnel construction can be observed.
While conventional tunneling methods can be sustained in non-shallow and moderately good strength soil/rock units, in shallow and clayey-sandy soils, it may be necessary to intensify the use of conventional support methods for tunnel lining and sometimes develop specialized lining systems for the tunnel to be constructed.
In this study, analysis models were prepared for a shallow tunnel located in an urban area, with a cover thickness of 6m, situated in a clay layer, using single-row and double-row umbrella arches for support design. Through the analyses conducted, comparisons were made regarding the effect on expected settlements at the tunnel crown and surface when the installation of umbrella arches in a shallow tunnel was doubled, thereby increasing the stiffness of the tunnel crown.
**Keywords:** Tunnel, Shallow Tunnels, Tunnel Support, Umbrella Arch, Plaxis 2D

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# Comparison of Earthquake Design Spectrums in Earthquake Regulations of Türkiye and USA

*Rana ÇORUH*[1]

## Abstract

It is known that earthquakes occur frequently in seismically active regions in the world. It is known that as a result of these earthquakes, many structures and especially people are affected with bad consequences. It is important to design earthquake-resistant structures to minimize these consequences and reduce structural damage. When designing buildings, it is necessary to consider the seismicity of the place where the building will be built. In order to examine the seismicity of a place, it is necessary to examine the frequency of active fault lines and the earthquakes that have occurred in that place before. By examining the earthquake records that occurred in a place, the earthquake response spectrum of that place can be obtained. In order to use it in design, we need to take into account both earthquake records and possible earthquakes that may occur. Design spectra are used to determine the earthquake load that should be used in the design of new structures. In this study; A comparison of earthquake design spectra in two selected earthquake codes was made. The aim of the study is; To learn about the earthquake design spectrums in Türkiye and the USA earthquake codes and to see the deficiencies and differences. First of all, the content and purposes of these two earthquake regulations are mentioned. Afterwards, the sections where earthquake design spectra are explained are explained under separate headings, respectively. Then, information about soil classes and design spectra were compared and presented in tables. As the last part of the study, horizontal elastic design spectra were drawn considering that a school building would be built in places where seismicity is frequent in both countries. Although the two regulations selected in this study have many similarities, the difference in the resulting design spectrums can be seen.

**Keywords:** Earthquake, Earthquake Design Spectrum, Earthquake Regulation, Design Acceleration, Soil.

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# Comparison of Mathematics Literacy Scores of Students in Turkey with Balkan Countries in PISA 2022 by School Type with Machine Learning and Propensity Score Matching.

*Derya ALKIN*[1]
*Serpil KILIÇ DEPREN*[2]

## Abstract

Propensity scores are defined as the conditional probability of assigning a unit to a particular treatment condition, given observed variables. As the number of covariates increases, it may become difficult to find units with characteristics similar to those in the treatment group. Corrections made to eliminate bias in the sample with the propensity score can also be made using the propensity score instead of using all covariates one by one. The aim of this study is to make predictions for the future by comparing the mathematical literacy scores of students in Turkey with the Balkan countries, based on PISA 2022 data, whether there are significant differences according to school type. In the study, MATHPERS, FAMCON, DISCLIM, TEACHSUP, FUMSUP variables from the student survey were used as covariates, school type from the school survey was used as the independent variable, and mathematical literacy from the cognitive tests was used as the outcome variable. Since the terms treatment and control group are used in Propensity Score Matching, private school was used as the treatment group and public school was used as the control group. As a result of this study, it is seen that Turkey shows a better picture in terms of mathematical literacy than the Balkan countries. In the study, predictions were made for Turkey's future success in mathematics with PISA 2022 data.

**Keywords:** PISA 2022; Propensity Score Matching; Mathematics Literacy; Machine Learnig; Education

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# An Analysis of Some Notable Blockchain-based E-auction Systems

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## Abstract

An electronic auction, also known as an e-auction, allows items to be sold online. Many companies have transitioned to an e-auction system because of its superior mobility compared to traditional auctions. Typically, e-auctions are categorized as either open bid or sealed-bid auctions, depending on the transparency of the auction price and the method used to determine the winning offer. While open bid auctions reveal all bid prices and their bidders, sealed-bid auctions only reveal the winning bid price. In sealed bid e-auctions, privacy is achieved thanks to cryptographic primitives, making such auctions often desirable for the bidder and the seller by preventing information leakage. Creating a secure sealed-bid e-auction system requires the use of a third-party intermediary between the seller and bidder to trade the auction. Fortunately, blockchain technology has the potential to ensure the integrity of recorded data and transparent verification without the need for a centralized third-party intermediary. However, implementing blockchain technology in e-auctions necessitates the use of additional cryptographic primitives, such as commit-reveal, to keep bids secret. In the sealed-bid e-auction literature, several blockhain-based works have been proposed. In this work, we analyze some notable blockchain-based sealed-bid e-auction systems in terms of their focused design requirements to establish the trust of the user and their drawbacks. Based on this analysis, we give the relation between the design requirements and their potential cryptographic primitives to meet requirements for general e-auction systems.

**Keywords:** E-auction, Sealed-bid auction, blockchain, bidder, bid

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# A New Global Tool for In Situ Conservation of Biodiversity: OECMs

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## Abstract

Biodiversity loss stands as a significant global environmental challenge today. Protected Areas (PAs) are crucial for in situ conservation efforts, safeguarding the protection of ecosystems as a whole. However, despite their expansion, PAs alone have not curbed biodiversity decline as desired. Hence, the concept of "Other Effective Area-based Conservation Measures (OECMs)" was emerged especially under Aichi Target 11 in the 2011-2020 Strategic Plan for Biodiversity adopted by the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD). Strategic goal C emphasized conservation through linked protected area systems and OECMs. Areas contributing to Aichi Target 11 now include OECMs in addition to traditional PAs. In short, OECMs are intended to function like protected areas; however, the main difference between them and protected areas is that OECMs are not officially or legally designated as protected areas. The former has got a primary conservation objective, while the latter delivers biodiversity conservation outcomes as a by-product of achieving a different goal. While lacking a formal definition until 2018, OECMs progressed slowly globally due to limited examples and evaluations. Their coverage remains significantly lower than PAs (World Database on Protected Areas (WDPA) and World Database on OECMs February 2024 conserved area coverage in terrestrial and inland waters data; PAs 16.06%, OECMs 1.18%). However, the majority of scientific research evaluates OECMs as a new conservation paradigm in the protection of biological diversity and an opportunity to achieve global conservation goals. Consequently, OECMs, which were included as a new conservation strategy in Aichi Target 11 in 2010, continue to be recognized along with protected area systems as tools that can be applied to reduce threats to biodiversity in the Kunming-Montreal Global Biodiversity Framework adopted by COP15.

**Keywords:** OECMs, Biodiversity, Protected Areas, Nature Conservation, Area-based Conservation

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# Development of Sustainable Solid Soap Packaging with Increased Ink Adhesion

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*Beyza EFE CİGDEM* [2]
*Alperen KONUK* [3]
*Omer YILDIRIM* [4]
*Eda ARKON* [5]

## Abstract

The solid soap packaging we use in daily life is usually made of PET/Paper packaging materials. However, PET/Paper packaging is not in the recyclable product category. PET film, which has a biodegradability of 400 years, has been removed from the packaging structure and packaging consisting entirely of paper material has been developed instead. It ensures that the product is both recyclable and that paper waste that cannot reach recycling facilities degrades in nature in a short time.

While reverse printing technique is used in PET/Paper structure, it becomes technically required to use surface printing technique when switching to single layer paper structure. When using the reverse printing technique, the ink remains between the PET and Paper structures and the lack of contact with the outdoor protects the print from physical factors. In the surface printing technique, the ink is applied to the front surface of the paper, making the ink open to contact with the outdoor.

In addition, the difficulty of using a single layer of paper in packaging material is the deformation of the coating on the paper. This condition disrupts the visual integrity of the packaging and negatively affects the quality of the packaging.

To increase the ink adhesion of the packaging surface, over print varnish and primer lacquer were used to prevent deformation of the sustainable single-layer paper packaging.

To evaluate the performance of the newly developed structure, creasing test, friction coefficient test, gloss measurements, friction resistance test and tape adhesion test measurements were performed. As a result, the ink was found to be resistant to deformations of the newly developed (mono-structured) paper packaging material in line with the test results. The transition to paper (mono) structure is of great importance for environmentally friendly products and sustainability.

**Keywords:** Paper, Recycle, Mono packaging, Ink adhesion, Varnish

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# Inspiring the Project Process: Exploring Text-to-Image Technology in Interior Architecture Education

*Tuğçe ÇELİK*[1]

## Abstract

In interior design education, the design studio serves as a dynamic space where creativity flourishes and design concepts come to life. This study particularly examines the role of inspiration in the design process through the use of text-image technology. Drawing from design theory, this research explores how text-image technology can awaken and enhance the creative process of interior design students. By translating text-based instructions, descriptions, and concepts into visual representations, this technology offers a unique way to trigger creativity and foster innovative design solutions. Using mixed methods involving studio critiques, juries, and design exercises, this study investigates the impact of integrating text-image technology into interior design curricula. It examines how students perceive and utilize this technology, its influence on generating and developing design ideas, and its overall impact on the learning experience. Findings indicate that text-image technology not only facilitates idea generation but also enhances a deeper understanding of design concepts and their visual interpretation. Furthermore, by encouraging collaboration and communication among students, teachers, and industry professionals, this technology enriches the learning environment within the design studio. By showcasing the potential of text-image technology as a catalyst for inspiration and innovation within interior design curricula, this research contributes to pedagogical discussions surrounding design education. It provides insights for educators aspiring to integrate emerging technologies into studio-based learning environments, enabling students to explore and express their creative visions more effectively.

**Keywords:** Architectural Design, Interior Architecture Education, Artificial Intelligence, Text-to-image generation, Project studio

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# Biological Risk Factors in Histology Laboratories

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*Bülent ÜNVER*[3]

## Abstract

Laboratories serve for purposes such as health assessment, disease prevention, diagnosis, follow-up, treatment monitoring and prognosis prediction. Histology laboratories are laboratories that make tissue samples suitable for examination under a microscope using special techniques. It is often used as part of pathology, surgery, and clinical trials. The results obtained in histology laboratories can be helpful for diagnostic and research purposes and in diagnosing diseases, treatment planning and understanding disease processes. Laboratory environments can have a variety of hazards and physical, chemical, and biological risks. Therefore, it is important to recognize the risks in workplaces. It is difficult to set a specific limit for biological risks. Because biological risks arise from living things such as microorganisms, viruses or pathogens, and their effects may differ between people. Biological risk factors 1. Group biological factors: Biological factors that do not cause disease in humans, 2. Group biological factors: Biological factors that can cause diseases in humans and harm employees, but do not have the risk of spreading to society, and have the opportunity to be protected or treated.3. Group biological factors: Biological factors that cause severe diseases in humans and pose serious risks to employees, have a risk of spreading to society, but usually have effective protection or treatment opportunities, 4. Group biological factors: They are classified as biological factors that cause severe diseases in humans and pose serious risks to employees, have a high risk of spreading to society but are not effective prevention and treatment methods. Biological risks in histology laboratories often arise from working with human tissues. There may be a risk of infection when coming into contact with diseased tissues or when examining under a microscope. These infections include bacterial, viral, or fungal infections. They can also contaminate other samples or materials in the environment caused by infection. Thus, it can increase the risk of contamination by causing the transmission of pathogens. Needlesticks or cuts increase the risk of infection that can be transmitted through blood.
Biological risks in histology laboratories should be prevented and controlled. It is important that biological factors are arranged in such a way as to prevent them from spreading to the environment or to be present at a minimum level in the environment. In general, collective protection measures should be taken or personal protective methods should be applied.
**Keywords:** Histology, Biological Risk Factors, Laboratory Safety

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# Comparison of Electric Powertrain Layouts to Investigate Optimization Solutions

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## Abstract

It wasn't long before it was predicted that hybrid electric/gasoline vehicles would become popular in vehicle evolution. However, battery cost has been decreased significantly last 2 decades. Also the new electric vehicle platforms provide more robust solutions for designers. They could find different solutions for different custumers' demands with same electric vehicle platform. In addition to that designers could easily change the subsystems of platform itself according to the different market demands. So, industry have realized that the battery electric vehicles will be more widespread than hybrid electric vehicles and will bring a lot of opportunities to create new products and related markets.For example micro mobility solutions become more widespread with those developments. With the evolution of battery electric vehicles, many traditional components of vehicles have changed with the new components. Major change is happened on the powertrain system of the vehicle. So, power electronic units and coolant and electrical layout have become more important on the vehicle architecture & packaging. Weight, volume, and interaction with the other components have significant role to create more sustainable vehicle packaging. To make simple and most effective design, electric vehicle industry has many different solutions. So, the solutions will be investigated in order to understand logic behind those designs and each role of the solutions.

**Keywords:** Battery Electric Vehicles, Power Electronic Units, Vehicle Architecture & Packaging Design, Powertrain Layout

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# Conceptual Design of an Innovative Railway Track Inspection Trolley System

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## Abstract

Railways have become a prominent mode of transportation in recent years due to their low cost, economic efficiency, and environmental friendliness. For this reason, railways are given importance and investments are made all over the world, especially in countries with developed economies. In our country, significant investments have been made in the expansion of high-speed and conventional railway networks, the renovation of existing lines, and the electrification and signaling of entire lines. In parallel with these investments, it has become important to carry out railway track measurements with high-tech maintenance vehicles for a safe, reliable and sustainable railway operation. Therefore, within the scope of this study, a conceptual design of a railway track inspection car was made to determine the geometric irregularities of the railway track and rails. This design process was carried out based on the systematic design approach of Pahl and Beitz. The conceptual design process consists of problem definition, formulation (function diagram), concept generation, and selection. In the conceptual design steps, tools from methodologies such as Quality Function Deployment (QFD), Theory of Inventive Problems Solving (TRIZ / TIPS), and Value Engineering (VE) were used to create an innovative, valuable, and customer-oriented design. Using QFD, customer requirements were translated into design parameters, and important design problems were identified. With the use of the TRIZ, innovative design features were determined, and more innovative solution options were proposed for the problems. Function analysis, one of the important steps of VE, was used to develop function relationships and identify important functions.

**Keywords:** Conceptual Design, Quality Function Deployment (QFD), Theory of Inventive Problem Solving (TRIZ / TIPS), Value Engineering (VE), Railway Track Inspection Trolley System

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# Development of a Regional and Temporal Atmospheric Model for Turkey

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## Abstract

Accurate knowledge of atmospheric conditions is crucial in various fields, including aviation, defence, and daily life. While direct measurement of atmospheric parameters is costly and impractical, atmospheric modeling offers a viable alternative. This study presents a regional and temporal atmospheric model for Turkey, addressing the limitations of the widely used International Standard Atmosphere (ISA) model.

The ISA model provides global averages for temperature and pressure, lacking regional and temporal specificity. To address this, the proposed model utilizes data from seven meteorological stations across Turkey, spanning 10 years and collected twice daily. The Levenberg–Marquardt Algorithm is employed to optimize the gathered data, enabling the development of regional and temporal models for eight atmospheric parameters: atmospheric pressure, dewpoint temperature, equivalent potential temperature, mixing ratio, potential temperature, relative humidity, temperature, virtual potential temperature and wind speed.

The developed models exhibit significant differences in altitude-dependent temperature and pressure characteristics compared to the ISA model. This highlights the importance of regional and temporal modeling, providing more accurate and realistic results for specific locations and time periods.

An additional benefit of the proposed model is its ability to track changes in atmospheric conditions over time. By analysing annual and monthly models, valuable insights can be gained into climate change patterns, aiding in the development of effective mitigation strategies.

In conclusion, this study presents a regional and temporal atmospheric model for Turkey, offering a more precise and localized approach compared to the ISA model. The model's ability to capture regional and temporal variations in atmospheric parameters, along with its potential for tracking climate change trends, makes it a valuable tool for various applications.

**Keywords:** Atmospheric modeling, aviation, ISA model, Turkey, climate change

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# Supporting Occupational Health and Safety with Lean 5S System

*Gökmen TAK*[1]
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## Abstract

By applying different production methods and techniques in different business lines in the manufacturing industry, physical, chemical, biological, etc. Many activities involving transactions are carried out. During the performance of these activities, many dangers, large or small, arise and are considered as risks. Hazards may arise from one factor or may arise due to more than one factor. While these hazards can arise from the layout of the working environment, machinery, chemicals, environmental factors, the characteristics and deficiencies of the equipment and devices used, they can also often arise from people's faulty behavior. Lack of tidiness in the working environment, lack of order and poorly defined working methods and styles reveal situations and behaviors that endanger occupational health and safety. By adding a Sixth S to the steps of SORT (Seiri), SET IN ORDER (Seiton), SHINE (Seiso), STANDARDIZE (Seiketsu) and SUSTAIN (Shitsuke), which are the principles of the lean 5S system, the contribution of the 6S (+safety) method to occupational health and safety in workplaces was evaluated.

**Keywords:** Lean 5S, Occupational Health and Safety, 6S

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# Examining the Effect of Natural and Recycled Fibers Used in Automotive Textiles on Acoustic Performance

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## Abstract

The fast advancement of technology and increasing customer demands have made driving comfort studies important in the automotive industry. Acoustic comfort, one of the main factors affecting driving comfort, is evaluated by NVH (Noise, Vibration, Harshness) departments. It is common to use special parts to reduce noise and vibrations. The use of environmentally friendly, sustainable and recyclable insulation materials is gaining importance. In this context, the demand for natural and recycled materials is increasing. While samples with high cotton content show sound absorption properties, the porous structure of natural fibers such as kapok fiber absorbs sound waves better. Hemp fibers are also valuable for sound insulation.

In this study, 20% hemp and kapok fiber were added to recycled cotton fiber and their acoustic performance was examined in the alpha cabinet device. The study aimed to compare the sound insulation and absorption abilities of felt materials with different fiber compositions used in the automotive industry. The Alpha cabin test has been used to determine the sound absorption coefficient of felt materials used in the automotive industry. Felt samples of various thicknesses and densities were tested.

As a result, felt containing kapok fiber with a density of 1400 g/m³ and a thickness of 25 mm exhibited the best sound absorption properties. This study highlights the usability and performance of recycled cotton and natural fibers for acoustic insulation in the automotive industry.

**Keywords:** Kapok Fiber, Hemp Fiber, Felt Materials, Alpha Cabin Test

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# Benefits of Mobility Hubs and Examples from European Cities

*Fatih Kerem BOZ*[1]

## Abstract

Mobility hubs are strategically integrated transportation centres designed to optimise urban mobility by facilitating seamless connections between various modes of transport within a single, accessible location. These hubs typically combine public transportation, such as buses, trams and trains, with shared mobility services including bicycles, scooters, and car sharing platforms. In addition, amenities such as parking facilities, retail outlets and information centres are also often available. Key benefits of mobility hubs include improved connectivity, reduced traffic congestion and reduced carbon emissions. By enabling effortless transfers between various modes of transport, mobility hubs encourage the adoption of sustainable travel alternatives over the use of private vehicles, thus contributing to cleaner and more efficient urban environments. European cities have been pioneers in deploying mobility hubs and have demonstrated their benefits through various successful implementations. For example, the Jelbi mobility app in Berlin exemplifies this integration by combining public transport with shared mobility services, allowing users to access bikes, scooters and cars via a unified app. This mobile app promotes a paradigm shift from private vehicle ownership to a more flexible and sustainable urban transport framework. Another notable example is "P+R" (Park and Ride) systems. These systems allow commuters to park their private cars on the outskirts of the city and switch to public transportation, reducing urban traffic and pollution. This study demonstrates mobility hubs and their key benefits, representing a significant advance towards sustainable urban transport. This study also shows examples from European cities, promoting multi-modal transport solutions, increasing user convenience, reducing dependence on private vehicles and contributing to the development of a more sustainable and efficient urban mobility network.

**Keywords:** Mobility hubs, sustainability, integration.

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# Investigation of Pipe Failure Reasons Encountered During Operation

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## Abstract

In order to ensure efficient use of water resources and sustainability in the water cycle, it is of great importance to ensure that drinking and utility water is consumed without waste and that existing losses are investigated and prevented. In this study, it is aimed to determine the causes of failures in the transmission of drinking water and to rank these causes in order to prevent water loss and other financial losses. It has been ensured that the causes of failure that can be aimed to be eliminated primarily according to the level of importance by grading and solution proposals for their elimination have been provided. In this context, the issue was handled in terms of polyethylene pipes, which are one of the most commonly used pipe types in our country and the causes of pipe failure, which were identified as a result of the literature study, were asked to the working group consisting of the technical personnel of the local administration, water canal administration and İller Bankası A.Ş., which are the stakeholders of the infrastructure sector, through a questionnaire study and the causes of failure were prioritised. For the methodology, the analytical hierarchy process was applied to determine the degree of importance between the problems presented objectively or subjectively to the study group in question and the main causes of failure were quantitatively determined. As a result, it is seen that the most commonly used pipe type in drinking water constructions is polyethylene pipe and the general failures are caused by manufacturing defects during the construction phase. The most common causes of pipe failures were found to be due to pipe joints, age of the pipe and pipe type, respectively.

**Keywords:** Pipe failure, Polyethylene pipes, Analytical hierarchy process

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# Investigation of The Usability of Base Isolation Systems in Reinforced Concrete Structures With Soft Floor Effect

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*Gamze ÜÇDEMİR*
*Mahmut KILIÇ*
*Abdulkadir Cüneyt AYDIN*

## Abstract

It is known that reinforced concrete structures containing soft storey effects suffer significant or pre-collapse damage during earthquakes. In this study, a number of methods have been proposed to ensure that reinforced concrete structures designed as soft floors for commercial purposes remain usable in possible major earthquakes and to prevent risks to people's lives. In the study, the effects of rubber-based and friction-based passive base isolation systems used in the literature on the earthquake behavior of reinforced concrete buildings with soft storey effect were investigated. Passive base isolation systems were used in the 8-storey reinforced concrete structure, whose dominant mode period was less than 1 s and whose ground floor was designed as a soft floor. Analyzes were carried out in the time history of the reinforced concrete structure for which a finite element model was created, under the influence of the ground motions of the 06 February Maraş-centered earthquake. The Pazarcık and Elbistan earthquake acceleration data used in the study were scaled in accordance with the structure within the scope of the Turkish Building Earthquake Regulation. In the case of both buildings analyzed in the study, base shear forces, displacement, floor acceleration values and energy dissipation were used as parameters. The study results showed that the rubber-based base isolation system significantly reduced the base shear forces, top displacements and floor accelerations in the reinforced concrete building with soft floor effect. It has been determined that rubber-based floor insulation systems are successful in absorbing earthquake energy. It has been concluded that by using base isolation systems, soft floor formation can be allowed in the ground floor of the reinforced concrete building.

**Keywords:** Rubber Based Isolation Systems, Maraş Earthquake's, Soft Floor Effect, Time history analysis.

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# Investigation of the Effects of Gas Turbine Periodic Maintenance on System Performance

*Orhan Özay KÖSE*[1]
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## Abstract

Gas turbines are widely used in electricity generation and cogeneration systems. Today, energy demand is increasing day by day with the developing economy and industry, which greatly increases the importance of energy supply security. In order to ensure energy supply security, it is important to carry out periodic maintenance of gas turbines used to provide uninterrupted and quality energy at continuous and certain performance values in electricity generating facilities on time. These periodic maintenance should be carried out in a predetermined equivalent operating hours. As a result of the periodic maintenance, sustainable working conditions of gas turbines and uninterrupted energy production at the desired performance values are largely ensured.

In this study; the working principle of gas turbines, historical development, components, classification, degradation factors and periodic maintenance in gas turbines and the effects of the fouling occurring in the filter system on the system operating performance and sustainability were examined. In order to be evaluated in this study, an example from a gas turbine combined cycle power plant installed in Türkiye was taken and the pre-maintenance and post-maintenance values were compared with each other. The effect of periodic maintenance on the system performance of the gas turbine and the effect of the change period of the filters in the turbine air inlet filter system within the scope of maintenance were examined. The change in turbine inlet air flow rate due to fouling in the filter system and its effects on fuel consumption and system efficiency were evaluated. It is aimed that the results obtained will contribute to the more efficient, uninterrupted, and sustainable energy production of gas turbines.

**Keywords:** Gas Turbine, Periodic Maintenance, Inspection, System Performance, Air Inlet Filter

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# Examination of Parameters Affecting the Elongation of Papers Used in the Production of Automobile Air Filters

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## Abstract

The Air filter is responsible for preventing substances such as dust, particles, and grains from entering the cylinders before the air in the atmosphere passes into the engine, and filtering and conveying the air required to the engine in a desired way under all operating conditions and allowing the engine to breathe. The main function of the filtering medium is the filter element paper, and they are materials with a complex structure. The bonds and fillers between the fibers form the general structure of the paper. It is very sensitive due to both the environmental conditions and its woody and hygroscopic structure. This woody structure absorbs the moisture in the environment, which affects the stable structure of the papers.

Air filter papers with three different structures were tested in weight test, permeability test, filter paper bursting strength test, filter paper pore diameter test, moisture detection test, air filter pressure test and FT-IR measurements, and the humidity and length change of the filter paper depending on time and environmental conditions and tests were applied. Air filter papers; After the package was opened, the test parameters were applied by keeping it under constant and variable environmental conditions, based on 0(zero), 24 (twentyfour hours), 48(fourtyeight) and 144(one hundered fourty four) hours.

Paper's structure allows it to absorb moisture in the environment, meaning that wet fibers extend more. It has been determined that this amount of elongation occurs faster and to a higher extent in paper samples kept in environmental conditions with varying temperature and humidity, while the opposite is true in papers kept in constant environmental conditions. The fact that paper is so much affected by its environment and the environmental conditions in which paper is found has provided extremely important information for both paper producers and secondary producers who use paper as raw material.

**Keywords**: Filter, Paper, Filtering Paper, Air Filter

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# Geologıcal And Petrographıcal Propertıes Of The Ozan (Yozgat-Akdagmadenı) Metallıc Mıneralızatıon

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*Aykut GÜÇTEKİN*[2]

## Abstract

This study focuses on the metallic mineralization around Akdağmadeni (Ozan Village) located in the northeast of the Kırşehir Massif in the Central Anatolian Crystalline Complex. The host rocks in which the mineralization is observed in the study area are marbles, dacites, dacitic tuffs, andesite, andesitic tuff, agglomerates, basalts and sedimentary rocks. Volcanic rocks consisting of lava flows and pyroclastic products are mostly rhyolite and anddacite in composition. Andesites crop out in the northern part of the study area, while dacites and rhyolites are widely spread around the Ozan Village. The siliceous outcrops formed from intense silicification are also common in these volcanic rocks, especially in veins. The thickness of quartz/silica veins in this region where the mineralization occurs varies between 0.5-15 meters. Volcanic rocks have a phyric and porphylic textures. Micro granular texture and quartz phenocrysts are quite common in dacitic and rhyolitic samples. In the chondrite-normalized REE diagram, the volcanic samples form a regular and semi-parallel patterns and there is common enrichment in LREE with respect to HREE. As a result of geochemical analysis of the major oxide contents, the mineralization is associated with epithermal deposits. In addition, petrographic determinations indicate that the ore minerals which are botryoidal formed in cavities and in different stages. Epigenetic mineralization is accompanied by chlorite-sericite paragenesis. The intense tectonism in the region facilitated the movement of hydrothermal solutions that caused mineralization within the host rocks.

**Keywords:** Metallic mineralization, geochemistry, Ozan, Akdağmadeni, Yozgat

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