



ICONIL 2026 SPRING

JUN 27-28, 2026 İSTANBUL / TÜRKİYE

6.INTERNATIONAL CONGRESS OF NEW SEARCHES IN MULTIDISCIPLINARY STUDIES SCIENCES PROCEEDINGS BOOK



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GÜNGÖREN BELEDİYESİ ALT+TAB KULUÇKA MERKEZİ GÜNGÖREN
İSTANBUL / TÜRKİYE

www.iconil.com

info@iconil.com

ISBN: 978-625-92230-1-8

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PAPER PRESENTATION PROGRAM

Paper Title	Authors	Congress	Presentation Type	Session Number	Hall	Date/Time	Session Chair
Nanoporous MOx-Molecularly Imprinted Polymers: Imprinted Fingerprints for Selective On-Site Food Matrix Sensing	- EZİNNE FAVOUR OGULEWE - Prof. Dr. Mustafa Gazi	Science Congress	Face to Face	01.Session	Salon-1	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>
STRATEGIC MANAGEMENT OF TOURISM DESTINATIONS: A COMPARATIVE QUALITATIVE ANALYSIS OF STRUCTURAL CHALLENGES IN TURKEY AND RUSSIA	- TİMUR SALPAGAROV - Assoc. Prof. Dr. Nihan Uğur	Social Sciences Congress	Face to Face	02.Session	Salon-2	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>
Future Prospects of Informatics Students in the Face of the Rise of Artificial Intelligence: A Quantitative Evaluation	Lecturer PhD. MUSTAFA OF	Social Sciences Congress	Face to Face	02.Session	Salon-2	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>
Comparison of WoS and Scopus Data on Generative Artificial Intelligence Supported Accounting Education	Lecturer İSMAİL KILIÇASLAN	Social Sciences Congress	Face to Face	02.Session	Salon-2	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>
Investigation of the Effects of Capacitor Switching and Transformer Saturation on Harmonic Resonance in Distribution Systems	- MERVE GÖKSU - Assist. Prof. Dr. Necmi Cemal Özdemir	Science Congress	Online	03.Session	Uzak Salon-1 https://tinyurl.com/bd2k45p7	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi Cemal Özdemir</i>
Investigation of the Effects of Nonlinear Loads and Harmonics on Neutral Current	- Serkan Barışık - PhD. Necmi Cemal Özdemir	Science Congress	Online	03.Session	Uzak Salon-1 https://tinyurl.com/bd2k45p7	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi Cemal Özdemir</i>
Vehicle Insurance Fraud Detection on Encoded Data with Synthetic Minority Oversampling-Based	- ENES KARAÇAVUŞ - Assist. Prof. Dr.	Science Congress	Online	03.Session	Uzak Salon-1 https://tinyurl.com/bd2k45p7	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi</i>

Paper Title	Authors	Congress	Presentation Type	Session Number	Hall	Date/Time	Session Chair
Extreme Gradient Boosting and Convolutional Neural Networks	CEYDA NUR ÖZTÜRK				m/bd2k45p7		<i>Cemal Özdemir</i>
The Harmonic Impact of Electric Vehicle Charging Stations on the Grid and Active Filters	- BETÜL ÖZGÜR - Assist. Prof. Dr. NECMİ CEMAL ÖZDEMİR - Prof. Dr. NURETTİN ABUT	Science Congress	Online	04.Session	Uzak Salon-2 https://tinyurl.com/3np3ampd	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi Cemal Özdemir</i>
Investigation of the Photocatalytic Activities of CBD-Synthesized CdO Thin Films under UV-A Light	- COŞKUN AYDEMİR - Prof. Dr. Prof. Dr. ALİ ERCAN EKİNCİ	Science Congress	Online	04.Session	Uzak Salon-2 https://tinyurl.com/3np3ampd	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi Cemal Özdemir</i>
Electrical Safety in Explosive Gas Atmospheres: Area Classification, Protection Methods, and Gas Detection	- BAŞAK YAĞMUR KILINÇ - Assist. Prof. Dr. Necmi Cemal Özdemir	Science Congress	Online	04.Session	Uzak Salon-2 https://tinyurl.com/3np3ampd	28.06.2026 12:00:00	<i>Assist. Prof. Dr. Necmi Cemal Özdemir</i>
CULTURAL HERITAGE CONSERVATION POLICIES AND WORLD HERITAGE SITES IN SPAIN: AN EVALUATION THROUGH THE CASE OF THE ALHAMBRA	BESTE TAŞ	Science Congress	Online	05.Session	Uzak Salon-1 https://tinyurl.com/4pzuy6fk	28.06.2026 13:00:00	<i>Assist. Prof. Dr. Ümmühan Akın</i>
EFFECT OF FREQUENCY ON CAPACITANCE AND CONDUCTANCE PROPERTIES OF Ag/rubrene/n-InP STRUCTURE AT ROOM TEMPERATURE	Assist. Prof. Dr. ÜMMÜHAN AKIN	Science Congress	Online	05.Session	Uzak Salon-1 https://tinyurl.com/4pzuy6fk	28.06.2026 13:00:00	<i>Assist. Prof. Dr. Ümmühan Akın</i>

Paper Title	Authors	Congress	Presentation Type	Session Number	Hall	Date/Time	Session Chair
FROM GLOBAL DISRUPTION TO REGIONAL RESILIENCE: HOW COVID-19 RESHAPED ALBANIA'S TRADE STRUCTURE	- Lecturer PhD. ARJOLA MITAJ - Prof. Dr. FLORA MERKO - Lecturer Matilda Haxhiu	Social Sciences Congress	Online	06.Session	Uzak Salon-2 https://tinyurl.com/39kjbjjz	28.06.2026 13:00:00	Lecturer Dr. Arjola Mitaj
Key Challenges in the Education of Autistic Children: Teacher, Parent, and System Perspectives	Eda Yıldırım	Social Sciences Congress	Online	06.Session	Uzak Salon-2 https://tinyurl.com/39kjbjjz	28.06.2026 13:00:00	Lecturer Dr. Arjola Mitaj
Paleoenvironmental Reconstruction of Hydrological Shifts in Lake Stiol (Romania) Using Subfossil Chironomids From a Short Sediment Core	- Selen Kızılkaya - Prof. Dr. Ladislav Hamerlík - PhD. Tímea Chamutio vá - Silvia Bartóková - Prof. Dr. Peter Bitušík	Social Sciences Congress	Online	06.Session	Uzak Salon-2 https://tinyurl.com/39kjbjjz	28.06.2026 13:00:00	Lecturer Dr. Arjola Mitaj
ANALYSIS OF THE ECONOMIC AND SOCIAL DIMENSIONS OF YOUTH UNEMPLOYMENT IN TURKEY	PhD. Uğur Erdem	Social Sciences Congress	Online	06.Session	Uzak Salon-2 https://tinyurl.com/39kjbjjz	28.06.2026 13:00:00	Lecturer Dr. Arjola Mitaj
Abstract The embodiment of lyrical-poetic imagery in Nariman Mammadov's songwriting	PhD. AYNUR QASIMOVA	Social Sciences Congress	Online	07.Session	Uzak Salon-1 https://tinyurl.com/2s4e58ry	28.06.2026 14:00:00	Lecturer Dr. Bülent Koparan
THE DEVELOPMENT OF CHARACTERS IN JAPANESE ANIME IN THE CONTEXT OF EXISTENTIALIST PHILOSOPHY: AN	SİNA ARSLAN ÜÇÜNCÜ	Social Sciences Congress	Online	07.Session	Uzak Salon-1 https://tinyurl.com/2s4e58ry	28.06.2026 14:00:00	Lecturer Dr. Bülent Koparan

Paper Title	Authors	Congress	Presentation Type	Session Number	Hall	Date/Time	Session Chair
ANALYSIS OF DEATH NOTE							
THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN ACADEMIC WRITING: AN EXAMINATION OF ETHICAL ISSUES	- Assist. Prof. Dr. EKİN BAHAR KAYA - Assistant PhD. İrem Çakır	Social Sciences Congress	Online	07.Session	Uzak Salon-1 https://tinyurl.com/2s4e58ry	28.06.2026 14:00:00	<i>Lecturer Dr. Bülent Koparan</i>
HISTORICAL EVOLUTION OF AZERBAIJANI FOLK DANCES AND ANALYSIS OF THEIR MUSICAL-CHOREOGRAPHIC STRUCTURE	Assoc. Prof. Dr. GÜNAY MEMME DOVA	Social Sciences Congress	Online	07.Session	Uzak Salon-1 https://tinyurl.com/2s4e58ry	28.06.2026 14:00:00	<i>Lecturer Dr. Bülent Koparan</i>
Techno-Economic Assessment of an Integrated Offshore Wind-Based Alternative Marine Fuel Production Facility: The Bozcaada YEKA Case	- ENDER ATEŞ - Assoc. Prof. Dr. NADER JAVANİ	Science Congress	Poster	08.Session	Poster Alanı	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>
Synthesis, Characterization and Investigation of Photochemical Properties of Zn(II) Phthalocyanine Compounds Containing 4-Phenoxy Groups	- MÜCELL A DOĞRU - Prof. Dr. ÜMİT SALAN	Science Congress	Poster	08.Session	Poster Alanı	27.06.2026 12:00:00	<i>Lecturer Dr. Mustafa Of</i>

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ABSTRACTS / POSTERS

The abstract fields of the papers that have met all the conditions of the ICONIL 2026 SPRING congress as abstract, poster and full text will be shown on the following pages. In addition, the full texts of the papers that have been applied as full text are available on the following pages.

INVESTIGATION OF THE EFFECTS OF CAPACITOR SWITCHING AND TRANSFORMER SATURATION ON HARMONIC RESONANCE IN DISTRIBUTION SYSTEMS

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Abstract

Harmonic resonance is one of the major power quality problems in electrical distribution systems, especially in the presence of capacitor banks and nonlinear system components. Capacitor switching may alter the system impedance characteristics and lead to resonance at specific harmonic frequencies, resulting in increased harmonic distortion and temporary overvoltages (TOV). In addition, transformer saturation may intensify resonance effects by generating nonlinear magnetizing currents containing low-order harmonics. In this study, the effects of capacitor switching and transformer saturation on harmonic resonance were investigated using MATLAB/Simulink. Different capacitor bank configurations were analyzed, and resonance frequency, Total Harmonic Distortion (THD), and Q-factor variations were evaluated under various operating conditions. Simulation results showed that different capacitor values shifted the resonance frequency toward different harmonic regions, significantly affecting harmonic amplification and THD levels. It was also observed that transformer saturation increased low-order harmonic components and intensified resonance conditions. Furthermore, mitigation methods such as reactor implementation were evaluated to reduce resonance effects and improve power quality performance. The obtained results demonstrate that capacitor bank selection and transformer operating characteristics have critical importance for harmonic resonance behavior in distribution systems.

Keywords: Harmonic Resonance, Capacitor Switching, Transformer Saturation, Thd, Q-factor, Power Quality, Matlab/simulink

INVESTIGATION OF THE EFFECTS OF NONLINEAR LOADS AND HARMONICS ON NEUTRAL CURRENT

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Abstract

Today, with the widespread use of power electronics-based devices, switching power supplies, LED lighting systems, motor drives, and various electronic loads, harmonic distortions in electrical power systems have significantly increased. These nonlinear loads not only distort current and voltage waveforms, but also cause unexpectedly high currents to flow through the neutral conductor, especially in three-phase systems. The main purpose of this study is to examine the effects of harmonics generated by nonlinear loads on neutral current from both theoretical and practical perspectives, particularly analyzing the current increases caused by triplen harmonics (third-order harmonics and their multiples) in the neutral conductor. In addition, the effects of harmonic-related neutral currents on conductor heating, energy losses, power quality deterioration, and system reliability will be evaluated. In this study, harmonic generation mechanisms will be investigated based on academic literature, nonlinear load behaviors in three-phase systems will be analyzed, and the formation processes of neutral current will be explained. Furthermore, the relationship between harmonic levels and neutral current under different load scenarios will be evaluated. The research will mainly focus on the following topics: Harmonic generation mechanisms of nonlinear loads, behavior of harmonic currents in three-phase systems, accumulation effect of triplen harmonics in the neutral conductor, effects of harmonics on power quality, excessive neutral conductor current and overheating problems, harmonic mitigation and filtering methods. This study aims to contribute to a better understanding of harmonic-related problems in power systems and to raise technical awareness regarding the reduction of risks caused by excessive neutral currents.

Keywords: Power Unbalance, Non-linear Loads, Harmonic Distortion, Power Quality, Neutral Current

CULTURAL HERITAGE CONSERVATION POLICIES AND WORLD HERITAGE SITES IN SPAIN: AN EVALUATION THROUGH THE CASE OF THE ALHAMBRA

Beste Taş

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Abstract

The conservation of cultural heritage is an interdisciplinary process aiming to transmit the tangible and intangible values of past civilizations to future generations. Particularly since the second half of the twentieth century, international conventions and conservation policies have emphasized that cultural heritage should be evaluated not only at the scale of individual monuments but also together with urban fabric, cultural landscapes, and the natural environment (Kuban, 2000; Jokilehto, 1999). This study aims to evaluate the cultural heritage conservation approach in Spain by examining the historical development of conservation theory, the fundamental concepts within the UNESCO World Heritage system, and conservation policies in Europe. The research specifically focuses on Spain's conservation legislation, the Spanish Historical Heritage Law No. 16/1985, and the conservation areas of the Alhambra, Generalife, and Albayzín, which are included on the UNESCO World Heritage List. A qualitative research methodology was adopted in the study; literature review, analysis of international conventions, examination of conservation laws, and case study evaluations were conducted. The findings indicate that Spain's conservation approach is based on a multilayered system that ensures coordination between central administration and local authorities. Furthermore, it has been observed that the Alhambra Conservation Area presents a holistic conservation model that protects not only monumental architecture but also the environmental context, cultural landscape, and historic urban fabric together. The study reveals that within the contemporary understanding of conservation, cultural heritage is regarded not merely as a physical object, but also as a carrier of social memory, identity, and cultural continuity. Keywords: conservation theory, cultural heritage, UNESCO, Spain, Alhambra, World Heritage Sites

Keywords: Conservation Theory, Cultural Heritage, Unesco, Spain, Alhambra, World Heritage Sites

THE HARMONIC IMPACT OF ELECTRIC VEHICLE CHARGING STATIONS ON THE GRID AND ACTIVE FILTERS

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Abstract

Introduction and Objective The widespread adoption of electric vehicles is causing harmonic distortions in distribution networks. The power electronics circuits used in EV charging stations generate harmonic currents, adversely affecting power quality. In this study, the effect of charging station density on harmonics has been investigated. The objective of this study is to reduce the harmonics occurring in EV charging stations through active filtering methods and to examine system performance. **Method** In the research, an EV battery charging system and a parallel active power filter (PAPF) model were developed in the MATLAB/Simulink environment. Initially, the total harmonic distortion (THD) was measured while the filter was disabled under a constant current charging circuit. Subsequently, after activating the filters for the Artificial Neural Network (ANN)-based Parallel Active Power Filter and the Synchronous Reference Frame Method (SRFM)-controlled Parallel Active Power Filter (PAPF), the compatibility between the reference current and the actual current was examined, and THD values were compared. System performances before and after filtering were comparatively analyzed using PAPF to reduce harmonic distortion in distribution networks. It has been determined that the conversion of AC current to DC current during the charging process leads to THD in the system. The filtering performances achieved using Buck-Boost and KY converters were also compared. **Findings** According to the simulation results, with the activation of the proposed ANN-controlled active filter, the THD value decreased from 19.13% to 4.66%. In the SRFM-controlled PAPF, the THD value is 1.01%. Thanks to the filter, the current on the grid side of the PAPF was converted into a nearly sinusoidal form. Through the use of PAPF, the filter isolated the grid from harmonic loading by generating the harmonic currents required by the load. The grid-side current THD when utilizing the KY converter was found to be 0.10%, whereas it was 0.49% for the Buck-Boost converter. **Conclusion and Recommendation** The obtained results demonstrate that the SRFM-controlled PAPF performs better than the ANN-controlled PAPF in terms of harmonic reduction, revealing that it reduces harmonic pollution in EV charging stations. The results show that the KY converter exhibits better performance than the Buck-Boost converter in terms of both THD and ripple content, making it a more suitable option for minimizing grid pollution. In the future, it is recommended that different filter topologies be evaluated in real-time applications.

Keywords: Electric Vehicles (evs), Charging Stations, Harmonic Distortion, Total Harmonic Distortion (thd), Parallel Active Power Filter (papf), Artificial Neural Network (ann), Buck-boost Converter, Ky Converter

SYNTHESIS, CHARACTERIZATION AND INVESTIGATION OF PHOTOCHEMICAL PROPERTIES OF ZN(II) PHTHALOCYANINE COMPOUNDS CONTAINING 4-PHENOXY GROUPS

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Abstract

Phthalocyanine (Pc) compounds are macrocyclic structures that exhibit aromatic properties due to their conjugated 18- π -electron systems; they are physically and chemically stable and can be diversified with various metals and functional groups. With their metal-containing and metal-free forms, and thanks to their suitable substitution possibilities, they possess broad application potential in many fields today, such as industrial catalysis, semiconductor materials, and sensor technologies. In recent studies, they have emerged as photostimulators in the field of photodynamic therapy (PDT), which can be activated by light of a specific wavelength and causes targeted cellular damage. Due to their high absorption capacity under visible light, their ability to be excited at longer wavelengths, high singlet oxygen ($^1\text{O}_2$) production, and photostable behavior, they are considered ideal candidates for photodynamic therapy. In this study, zinc(II) 2(3),9(10),16(17),23(24)-tetrakis-(4-chlorophenoxy)phthalocyaninate and zinc(II) 2(3),9(10),16(17),23 (24)-tetrakis(4-iodophenoxy)phthalocyaninato zinc(II) compounds were synthesized to enhance the efficacy of PDT applications. In the structural modification process, 4-chlorophenol and 4-iodophenol were used as starting compounds. The aim was to observe the effects of halogens with different electron-withdrawing characters on the macrocyclic ring. The structures of the obtained unique macrocyclic compounds were characterized using FT-IR, UV-Vis, ^1H -NMR, and MALDI-TOF MS, and various photophysical and photochemical properties, such as photodegradation and singlet oxygen quantum yield, were investigated. The results demonstrated that the synthesized halogenated Zn(II) phthalocyanine derivatives exhibit high photostability and efficient singlet oxygen production, suggesting they could serve as potential photoinitiator agents for PDT.

Keywords: Phthalocyanine, Photodynamic Therapy (pdt), Characterization, Spectroscopy

ELECTRICAL SAFETY IN EXPLOSIVE GAS ATMOSPHERES: AREA CLASSIFICATION, PROTECTION METHODS, AND GAS DETECTION

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Abstract

This study addresses electrical risk management processes, technical standards, and safety systems in industrial facilities with potentially explosive gas and vapor atmospheres through a holistic approach. With the aim of minimizing explosion risks at the source in industrial environments; hazardous area classifications, flammable gas characteristics, electrical protection methods, and the operating principles of gas detection systems have been examined within the framework of European Union ATEX directives and IEC 60079 standards. To prevent accidents, it has been emphasized that integrating electrical area classification processes with analytical evaluation tools such as HAZOP, FMEA, or LOPA is of vital importance. Furthermore, categorizing hazardous areas as Zone 0, Zone 1, and Zone 2 based on the frequency of explosive atmosphere occurrence, in accordance with the IEC/EN 60079-10-1 standard, has been described as the first step required for the safe design of electrical installations. Moreover, by cross-evaluating the lower (LEL) and upper explosive limits (UEL) of flammable gases, industrial gas groups (IIA, IIB, IIC), and ignition temperature classes (T1-T6), the necessity of using Ex-proof equipment suitable for ambient conditions has been demonstrated. Accordingly, flameproof (d-Type), increased safety (e-Type), and intrinsically safe (i-Type) protection methods have been examined; it has also been stated that labeling field equipment to include the Equipment Protection Level (EPL) and explosion group, in accordance with the ATEX 2014/34/EU directive, is of critical importance in terms of traceability. As a result of the analyses, it has been determined that in addition to correct equipment selection to prevent risks at the source, gas detection systems—acting as an early warning barrier against potential leaks—play a decisive role in occupational health and facility safety. In this context, it has been established that detectors should be calibrated via %LEL values and designed to activate when the gas level reaches the 10% to 20% LEL range. Additionally, it is concluded that positioning fixed sensors at the correct heights in the field based on the relative density of the chemicals posing a leak risk (whether they are heavier or lighter than air), as well as the appropriate placement of portable devices carried by personnel, are of vital importance.

Keywords: Atex, Explosive Atmospheres, Gas Detection Systems, Risk Management, Zone Classification

EFFECT OF FREQUENCY ON CAPACITANCE AND CONDUCTANCE PROPERTIES OF AG/RUBRENE/N-INP STRUCTURE AT ROOM TEMPERATURE

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Abstract

This study aimed to determine the capacitance-voltage-frequency (C-V-f) and conductance-voltage-frequency (G/w-V-f) properties of organic/inorganic semiconductor structure prepared using n-type InP substrate and rubrene organic material. In the designed structure, the rubrene thin film was grown on the n-InP substrate using spin coating method. The C-V and G/w-V measurements were performed under different frequency at room temperature. Frequency-dependent capacitance and conductivity measurements provide important information about parameters affecting device performance, such as series resistance (R_s) effects. The C-V and G/w-V curves obtained from the measurements have three distinct regions called accumulation, depletion and inversion at each frequency. The changes in C and G/w values, which depend on both frequency and bias voltage, occur particularly in the accumulation and depletion regions, while they remain nearly constant in the inversion region. However, it has been observed that the capacitance values show a decreasing trend with increasing frequency in the applied voltage values. As the frequency value increases, the contribution of interface capacitance to the device capacitance decreases. In addition, the effects of series resistance are also clearly visible in the C-V characteristics. Therefore, the R_s values of Ag/rubrene/n-InP structure were determined as a function of frequency for different bias voltages and it was seen that the R_s values change strongly with the frequency values as well as with applied bias voltage. Thus, it can be said that R_s has a strong influence on device performance. In conclusion, these findings suggest that rubrene-based hybrid structures can contribute to the optimization of organic/inorganic semiconductor devices for organic electronic applications.

Keywords: Capacitance/conductance-voltage, Series Resistance, Frequency Dependence, Rubrene, Inp

INVESTIGATION OF THE PHOTOCATALYTIC ACTIVITIES OF CBD- SYNTHESIZED CDO THIN FILMS UNDER UV-A LIGHT

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Abstract

In this study, CdO thin films were successfully synthesized on fluorine-doped tin oxide (FTO) substrates using the chemical bath deposition (CBD) method. The structural, morphological, and optical properties of the produced thin films were thoroughly investigated using advanced characterization techniques such as XRD, AFM, and UV–Vis spectroscopy. The photocatalytic activities of the films were evaluated through the degradation of methylene blue (MB) dye in aqueous solutions under ultraviolet (UV) irradiation (365 nm). The obtained results demonstrated that the synthesized CdO thin films exhibited promising characteristics for photocatalytic applications owing to their effective light absorption under UV irradiation and favorable surface morphology. These findings provide a promising foundation for the future development of CdO/ZnO composites for environmental remediation and advanced wastewater treatment applications, and represent an important step within the scope of the thesis study toward the development of a highly efficient photocatalyst.

Keywords: Chemical Bath Deposition , Cdo, Photocatalysis, Methylene Blue

VEHICLE INSURANCE FRAUD DETECTION ON ENCODED DATA WITH SYNTHETIC MINORITY OVERSAMPLING-BASED EXTREME GRADIENT BOOSTING AND CONVOLUTIONAL NEURAL NETWORKS

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Abstract

Insurance fraud hampers the accurate evaluation of claims and imposes significant costs on insurers. This study comparatively evaluated machine learning and deep learning models for fraud detection in vehicle insurance claims. The publicly available dataset initially consisted of 15,420 records and 33 variables, with a fraud rate of approximately 6%; after feature engineering, a 91-feature representation was obtained. The workflow comprised data cleaning, exploratory data analysis, feature selection, categorical encoding, class imbalance mitigation, and comparative model training. For categorical variables, one-hot encoding, target encoding, and its leakage-safe variant were evaluated. To assess the effect of class imbalance, a baseline without resampling was compared with the synthetic minority oversampling technique (SMOTE), BorderlineSMOTE, and the conditional tabular generative adversarial network (CTGAN). Logistic regression, support vector machines, random forest, extreme gradient boosting (XGBoost), clustering-based approaches, and different convolutional neural network (CNN) architectures were trained and evaluated under the same validation and test protocol. The combination of target encoding, BorderlineSMOTE, and XGBoost yielded the highest validation performance. The final model was selected based on validation average precision, while F1 score and recall were also interpreted for practical use. On the test set, the final model achieved an F1 score of 0.3095, recall of 0.5652, precision of 0.2131, an area under the receiver operating characteristic curve (ROC-AUC) of 0.8591, and average precision of 0.2833. These results show that the model could not capture all fraud cases; however, on this imbalanced dataset it prioritized the fraud class markedly better than a random ranking. Although CNN-based models were improved with knowledge distillation, one- and two-dimensional input representations, transfer learning, and soft voting, they could not surpass the XGBoost-based baseline on this dataset. The findings are largely consistent with the literature: for imbalanced and predominantly categorical tabular data, well-encoded gradient boosting forms a strong baseline that deep convolutional neural networks struggle to surpass. Overall, modeling vehicle insurance fraud data to capture more than half of fraudulent claims may help reduce unnecessary claim payments and investigation costs; however, misclassifying legitimate claims as fraudulent may also lead to unfair treatment of customers.

Keywords: Insurance Fraud, Vehicle Insurance Claims, Synthetic Minority Oversampling, Extreme Gradient Boosting, Convolutional Neural Networks, Comparative Performance Analysis

PALEOENVIRONMENTAL RECONSTRUCTION OF HYDROLOGICAL SHIFTS IN LAKE STIOL (ROMANIA) USING SUBFOSSIL CHIRONOMIDS FROM A SHORT SEDIMENT CORE

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Lake Stioli is a high altitude lake of glacial origin (1657 m a.s.l.) located in the Rodna Mountains in the Romanian Eastern Carpathians. The lake has a history of fish stocking, and following its illegal damming in 2002, the lake underwent significant morphological changes, including a marked increase in water depth. In the present study, subfossil chironomids and loss-on-ignition (LOI) analyses were performed on a 17 cm sediment core to reconstruct past environmental changes in the lake. The most abundant taxon was *Tanytarsus lugens*-type, comprising 67% of the total assemblage, followed by *Procladius* sp. at 15%. The bottom part of the core (17 - 14 cm), was characterized by low chironomid abundance. Between 14 and 7 cm depth, both number of taxa and head-capsule abundance increased significantly. The presence of cold-adapted and rheophilic taxa associated with flowing water, including *Diamesa zernyi/cinerella*-type, *Pseudodiamesa* and *Rheocricotopus effusus*-type, suggests an enhanced influence of cold-water inflow. In addition, the occurrence of semi-terrestrial Limnophyes-Paralimnophyes may be associated with water-level fluctuations. Variations in the abundance of *Procladius* sp. throughout the core may be associated with fish stocking that likely occurred multiple times in the lake. Loss-on-ignition (LOI) analyses revealed an increase in organic matter content toward the upper part of the core, while carbonate content remained relatively stable throughout the core. The chironomid assemblage changes, together with the increase in organic matter revealed by LOI, suggest a shift in lake conditions toward enhanced productivity. In the uppermost part of the core (7-0 cm) chironomid abundance decreased markedly; however, *Tanytarsus lugens*-type remained the dominant taxon. The research was supported by the project APVV-20-0358.

Keywords: Subfossil Chironomids, Stioli Lake, Rodna Mountains, Eastern Carpathians

FULL TEXT PAPERS

In this area, there are full-text papers sent to the ICONIL 2026 SPRING congress that meet the conditions of the congress.

CBD TEKNİĞİ İLE SENTEZLENMİŞ CDO İNCE FİMLERİN UV-A IŞIK ALTINDA FOTOKATALİTİK AKTİVİTELERİNİN İNCELENMESİ

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Özet

Bu çalışmada, CdO ince filmler, kimyasal banyo depozisyonu (CBD) yöntemi kullanılarak flor katkılı kalay oksit (FTO) altlıklar üzerine başarıyla sentezlenmiştir. Üretilen ince filmlerin yapısal, morfolojik ve optik özellikleri XRD, AFM ve UV-Vis spektroskopisi gibi ileri karakterizasyon teknikleriyle detaylı olarak incelenmiştir. Filmlerin fotokatalitik aktiviteleri ise, metilen mavisi (MB) boyasının ultraviyole (UV) ışınım (365 nm) altındaki sulu çözeltilerde bozunması üzerinden değerlendirilmiştir. Elde edilen sonuçlar, sentezlenen CdO ince filmlerinin UV ışık altında etkili ışık soğurma özelliği ve uygun yüzey morfolojisi sayesinde fotokatalitik uygulamalar için umut verici özellikler sergilediğini göstermiştir. Bu bulgular, ileride tasarlanan CdO/ZnO kompozitlerinin çevresel kirliliklerin giderilmesi ve ileri düzey atık su arıtımı uygulamaları için oldukça umut verici bir alt yapı oluşturmada ve yüksek verimli bir fotokatalizör adayı elde etmek için tez çalışmasının bir adımını oluşturmaktadır.

Anahtar Kelimeler: Kimyasal Banyo Depozisyonu, CdO, Fotokataliz, Metilen Mavisi

INVESTIGATION OF THE PHOTOCATALYTIC ACTIVITIES OF CBD-SYNTHESIZED CDO THIN FILMS UNDER UV-A LIGHT

Abstract

In this study, CdO thin films were successfully synthesized on fluorine-doped tin oxide (FTO) substrates using the chemical bath deposition (CBD) method. The structural, morphological, and optical properties of the produced thin films were thoroughly investigated using advanced characterization techniques such as XRD, AFM, and UV-Vis spectroscopy. The photocatalytic activities of the films were evaluated through the degradation of methylene blue (MB) dye in aqueous solutions under ultraviolet (UV) irradiation (365 nm). The obtained results demonstrated that the synthesized CdO thin films exhibited promising characteristics for photocatalytic applications owing to their effective light absorption under UV irradiation and favorable surface morphology. These findings provide a promising foundation for the future development of CdO/ZnO composites for environmental remediation and advanced wastewater treatment applications, and represent an important step within the scope of the thesis study toward the development of a highly efficient photocatalyst.

1. GİRİŞ

Günümüzde hızla artan çevresel kirlilik ve su kaynaklarının organik kirleticilerle kontaminasyonu, çevre dostu ve sürdürülebilir arıtım teknolojilerinin geliştirilmesini zorunlu kılmaktadır. Bu bağlamda, yarı iletken metal oksit tabanlı fotokatalitik süreçler; toksik olmayan yapıları, yüksek fotosensitiviteleri ve kimyasal kararlılıkları sayesinde ileri düzey atık su arıtımında oldukça etkin bir çözüm olarak öne çıkmaktadır (Albu vd., 2007; Hong vd., 2013).

Kadmiyum oksit (CdO), yaklaşık 2.2–2.8 eV bant aralığı, yüksek optik geçirgenliği ve iyi elektriksel iletkenliği sayesinde fotokatalitik uygulamalarda dikkat çeken n-tipi yarı iletken metal oksitlerden biridir (Raja et al., 2020). Literatürde yapılan çalışmalar, CdO ince filmlerinin organik kirleticilerin bozunmasında etkili bir fotokatalizör olarak kullanılabileceğini göstermiştir (Saravanan et al., 2011). Saravanan ve arkadaşları, CdO tabanlı yapıların ışık altında etkin yük ayrışması sağlayarak fotokatalitik verimi artırdığını rapor etmiştir (Saravanan et al., 2011). Raja ve arkadaşları, CdO ince filmlerinin yapısal özellikleri, yüzey morfolojisi ve optik davranışlarının katalitik performans üzerinde önemli rol oynadığını belirtmiştir (Raja et al., 2020). Ayrıca, Sharma ve arkadaşları tarafından gerçekleştirilen

çalışmada, kimyasal banyo depozisyonu yöntemiyle üretilen CdO ince filmlerinin yüksek kristal kalitesi ve homojen yüzey morfolojisi sergilediği gösterilmiştir (Sharma et al., 2019). Bu özellikleri nedeniyle CdO ince filmleri, çevresel kirliliğin giderilmesi ve atık su arıtımı gibi fotokatalitik uygulamalar için umut verici malzemeler arasında yer almaktadır (Raja et al., 2020; Saravanan et al., 2011).

Bu bildiride, optoelektronik ve fotokatalitik çevre remediasyonunda umut vaat eden CdO ince filmlerin düşük maliyetli ve etkili teknikler olan kimyasal banyo depozisyonu (CBD) yöntemi ile flor katkılı kalay oksit (FTO) altlıklar üzerine sentezlenmesi sunulmaktadır. Sentezlenen yapıların fotokatalitik aktiviteleri, ultraviyole (UV) ışınım altında organik bir model kirletici olan metilen mavisinin (MB) bozunması değerlendirilmiştir.

2. ÇALIŞMANIN YÖNTEMİ

2.1. Altlıkların Temizlenmesi

Çalışmada kullanılan flor katkılı kalay oksit (FTO) kaplı cam altlıklar, yüzeydeki organik kirlilikleri uzaklaştırmak ve homojen film tutunmasını sağlamak amacıyla sırasıyla aseton, izopropanol (IPA) ve deiyonize su (DI) içerisinde 15'er dakika ultrasonik banyoda yıkanmıştır. Yıkama işleminin ardından numuneler basınçlı azot/hava ile kurutulmuştur.

2.2. Kimyasal Banyo Depozisyonu (CBD) ile CdO Filmlerin Büyütülmesi

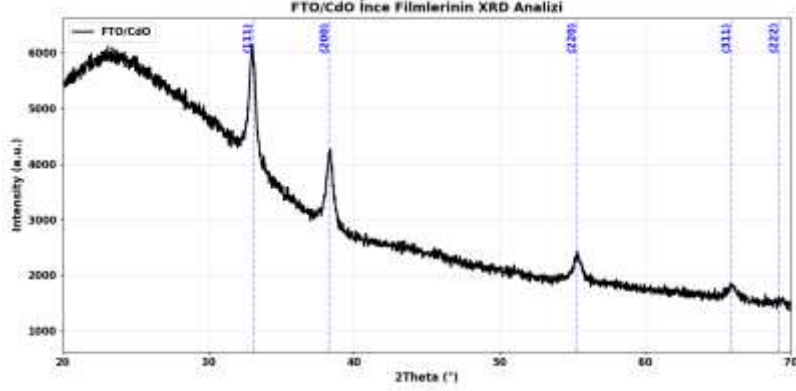
CdO ince filmler, önceden temizlenen FTO altlıklar üzerine CBD yöntemiyle sentezlenmiştir. Kadmiyum kaynağı olarak 0.08 M derişiminde kadmiyum nitrat tetrahidrat ($\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$) sulu çözeltisi hazırlanmıştır. Kompleks oluşturuca ajan ve pH düzenleyici olarak %25'lik amonyak (NH_3) çözeltisi, çözelti tamamen berraklaşana (tetraammin kadmiyum(II) kompleksi oluşana) kadar damla damla ilave edilmiştir. Hazırlanan çözelti 70°C'lik su banyosunda ısıtılmış ve FTO altlıklar dikey olarak daldırılarak 50 dakika boyunca kaplama (depozisyon) işlemi gerçekleştirilmiştir (Sharma vd., 2019). İşlem sonrası deiyonize su ile yıkanan numuneler, amorf kadmiyum hidroksit yapısını kristalin CdO fazına dönüştürmek amacıyla hava atmosferinde 400°C'de 2 saat tavlannmıştır.

2.3. Karakterizasyon Yöntemleri

2.3.1 X-Işını Kırınımı (XRD) Analizi

Şekil 2.1 de CdO ince film yapının XRD spektrumu görülmektedir. Filmin XRD pik konumları değerlendirildiğinde; $2\theta \approx 33.06^\circ$, 38.30° , 55.30° , 65.90° ve 69.20° açılarında ortaya çıkan sinyallerin, kübik Monteponte yapısındaki CdO fazına ait sırasıyla (111), (200), (220), (311) ve (222) kristal düzlemleri ile tam bir uyum içinde olduğu tespit edilmiştir (JCPDS Kart No: 05-0640).

(111) ve (200) düzlemlerine ait piklerin yüksek şiddeti dikkat çekicidir. En yüksek şiddetli pikin $2\theta \approx 33.06^\circ$ konumundaki (111) düzlemine ait olması, filmin altaş (FTO) yüzeyinde termodinamik olarak en kararlı yön olan (111) doğrultusunda tercihi bir büyüme (preferred orientation) sergilediğini kanıtlamaktadır. Kübik sistem için yapılan hesaplamalar sonucunda malzemenin örgü parametresi $a \approx 4.695 \text{ Å}$ olarak bulunmuştur. Bu değerin standart CdO birim hücre boyutlarıyla örtüşmesi ve ikincil fazlara ait herhangi bir safsızlık pikinin gözlenmemesi, uygulanan depozisyon ve tavlama işlemlerinin başarılı olduğunu teyit etmektedir.



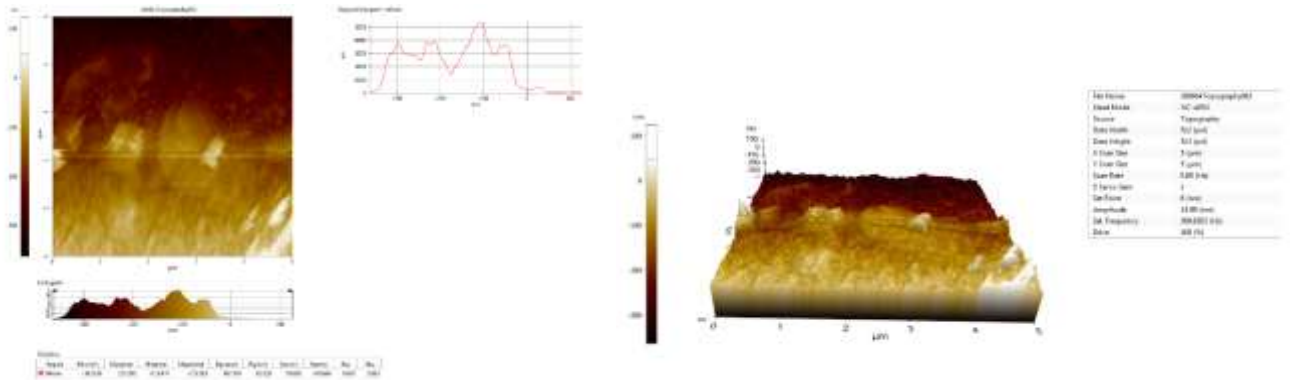
Şekil 0 FTO altlık üzerine sentezlenen ve 400°C'de tavlanan CdO ince filminin XRD spektrumu.

2.3.2 Yüzey Morfolojisi (AFM Analizi)

Sentezlenen CdO ince filmlerinin yüzey topografyasını ve pürüzlülük özelliklerini nanometre ölçeğinde incelemek amacıyla Atomik Kuvvet Mikroskobu (AFM) ölçümleri gerçekleştirilmiş ve elde edilen 2 boyutlu (2D) ile 3 boyutlu (3D) yüzey görüntüleri Şekil 2.2'de verilmiştir.

Şekillerdeki 2 ve 3 boyutlu yüzey profili incelendiğinde, CdO filminin altlık yüzeyini oldukça homojen ve yoğun bir şekilde kapladığı görülmektedir. Yüzeyde herhangi bir çatlak, makro boyutlu topaklanma (aglomerasyon) veya kaplanmamış derin boşluk (pinhole) bulunmamaktadır. Film yüzeyi, nanometre boyutlarında, düzenli dağılım gösteren küresel tepeliklerden (grain) oluşmaktadır.

Yazılım aracılığıyla gerçekleştirilen yüzey analizi sonucunda, filmin ortalama pürüzlülük (R_a) değeri **156 nm** ve karesel ortalama pürüzlülük (R_q / RMS) değeri ise **202 nm** olarak hesaplanmıştır.



Şekil 2.2. FTO altlık üzerine sentezlenen ve 400°C'de tavlanan CdO ince filminin 2D ve 3D AFM resimleri.

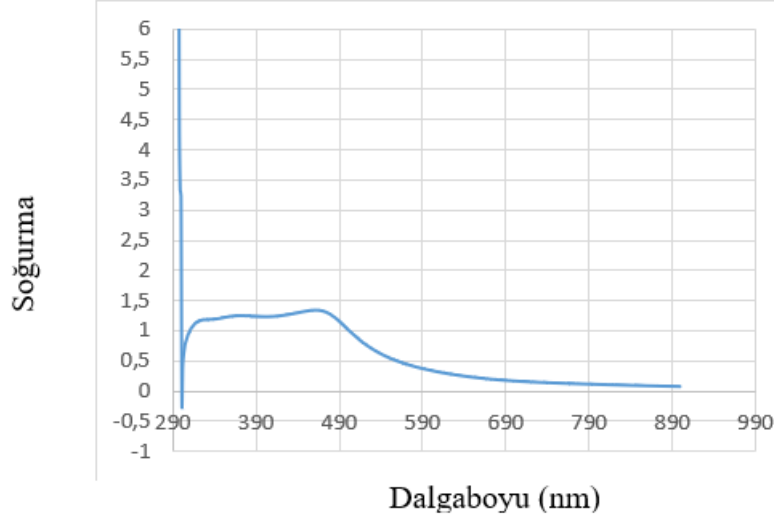
2.3.3 UV-Vis Soğurma Analizi ve Fotokatalitik Performans Değerlendirmesi

Şekil 2.3'te CdO ince filminin UV-Vis absorptans spektrumu verilmiştir. Spektrum incelendiğinde, filmin ultraviyole bölgede yüksek absorptans gösterdiği görülmektedir. Özellikle 300–400 nm dalga boyu aralığında absorptans değerinin maksimum seviyeye ulaştığı ve yaklaşık 385–390 nm civarında belirgin bir absorpsiyon tepesinin olduğu gözlenmektedir. Bu durum, CdO ince filminin UV ışınlarını etkin bir şekilde absorplayabildiğini ve fotouyarılma için uygun enerji seviyelerine sahip olduğunu göstermektedir.

Dalga boyunun artmasıyla birlikte absorptans değerlerinde düzenli bir azalma meydana gelmekte ve görünür bölgenin sonlarına doğru absorptans oldukça düşük seviyelere inmektedir. Yaklaşık 400 nm

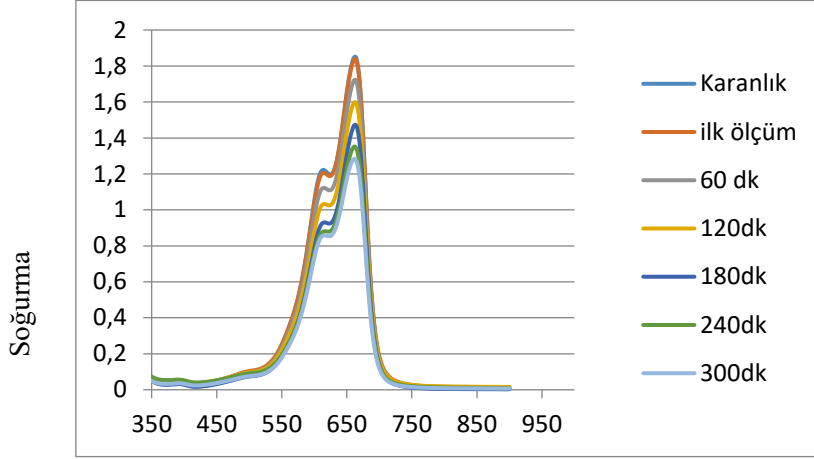
civarında gözlenen absorpsiyon kenarı, CdO'nun yarı iletken karakterini doğrulamakta ve malzemenin optik bant aralığı hakkında bilgi vermektedir.

Fotokatalitik açıdan değerlendirildiğinde, UV bölgede gözlenen yüksek absorpsiyon değerleri, ışık enerjisinin etkin bir şekilde soğurulmasını sağlayarak elektron-boşluk çiftlerinin oluşumunu desteklemektedir. Oluşan bu yük taşıyıcıları, yüzeyde adsorplanan su ve oksijen molekülleriyle reaksiyona girerek hidroksil ($\bullet\text{OH}$) ve süperoksit ($\text{O}_2\bullet^-$) radikalleri oluşturabilmekte, bu aktif türler ise metilen mavisi gibi organik kirleticilerin parçalanmasında önemli rol oynamaktadır. Bu nedenle sentezlenen CdO ince filmlerinin UV ışık altında fotokatalitik uygulamalar için uygun bir aday olduğu söylenebilir.



Şekil 2.3. FTO altlık üzerine sentezlenen ve 400°C'de tavlanan CdO ince filminin UV spektrumu

Şekil 2.4'de görüldüğü gibi CdO fotokatalizörü varlığında metilen mavisinin (MB) UV-A ışık altında fotokatalitik bozunması UV-Vis spektroskopisi ile kaydedilmiştir. Metilen mavisine ait yaklaşık 664 nm'deki karakteristik absorpsiyon pikinin ışınlama süresi arttıkça azaldığı görülmektedir. Karanlık ortam ve başlangıç ölçümleri arasında belirgin bir fark olmaması, boyanın CdO yüzeyine adsorpsiyonunun sınırlı olduğunu göstermektedir. Buna karşılık 60–300 dakika aralığında absorpsiyon şiddetindeki düzenli azalma, CdO'nun ışık altında metilen mavisinin parçaladığını ortaya koymaktadır. Ancak 300 dakika sonunda absorpsiyon pikinin tamamen kaybolmaması, fotokatalitik bozulmanın kısmi düzeyde gerçekleştiğini ve mevcut koşullarda CdO'nun sınırlı bir fotokatalitik verime sahip olduğunu göstermektedir. Karanlık ortamda alınan spektrumda görülen küçük dalgalanmalar, CdO partiküllerinin süspansiyon içerisindeki dağılımına bağlı ışık saçılması, adsorpsiyon–desorpsiyon dengesi ve cihaz kaynaklı baz çizgisi gürültüsü ile ilişkilendirilebilir. Bu dalgalanmalar ana absorpsiyon bandında belirgin bir kaymaya neden olmadığından fotokatalitik bozunma eğilimini olumsuz yönde etkilememektedir.



Şekil 2.4. FTO altlık üzerine sentezlenen ve 400°C'de tavlanan CdO ince filminin UV-A altında Metilen Mavisi içinde soğurma spektrumu

3. SONUÇ

Bu çalışmada, CdO ince filmler FTO altlıklar üzerine kimyasal banyo deposisyonu yöntemiyle başarıyla sentezlenmiş ve yapısal, morfolojik, optik ve fotokatalitik özellikleri incelenmiştir. XRD analizleri, elde edilen filmlerin kübik CdO fazına sahip olduğunu ve belirgin kristal yapının oluştuğunu göstermiştir. AFM sonuçları, filmlerin yüzeyi homojen şekilde kapladığını ve nanometre ölçeğinde pürüzlü bir morfolojiye sahip olduğunu ortaya koymuştur. UV-Vis absorbands sonuçları ise CdO ince filmlerin özellikle UV bölgede ışık soğurma kabiliyetine sahip olduğunu göstermektedir. Metilen mavisi çözeltisi içerisinde UV-A ışık altında gerçekleştirilen fotokatalitik testlerde, yaklaşık 664 nm'deki karakteristik absorbands pikinin ışınlama süresine bağlı olarak azaldığı belirlenmiştir. Bu sonuç, sentezlenen CdO ince filmlerin metilen mavisinin bozunmasında fotokatalitik aktivite gösterdiğini ortaya koymaktadır. Ancak 300 dakika sonunda absorbands pikinin tamamen kaybolmaması, mevcut deney koşullarında CdO'nun fotokatalitik veriminin sınırlı düzeyde kaldığını göstermektedir. Bu nedenle yapılan çalışma, CdO tabanlı yapıların fotokatalitik davranışını değerlendirmeye yönelik tez çalışmasının bir kısmını oluşturmaktadır. Elde edilen bulgular doğrultusunda, fotokatalitik etkinliği artırmak amacıyla sonraki aşamada CdO yüzeyinde ZnO tabakası oluşturularak CdO/ZnO heteroyapılarının hazırlanması planlanmaktadır. Böylece yük taşıyıcı ayrışmasının iyileştirilmesi ve metilen mavisi gibi organik kirleticilerin daha yüksek verimle giderilmesi hedeflenmektedir.

"Bu çalışma, Coşkun AYDEMİR'in "ZnO/CdO İnce Film Yapıların Sentezi, Karakterizasyonu ve Fotokatalitik Aktivitelerinin İncelenmesi" başlıklı yüksek lisans tez çalışmasının bir bölümünden üretilmiştir."

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