International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024)

PROCEEDINGS BOOK

July 19-21, 2024

Erdek/Balikesir, Türkiye

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Supporters

International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024)

Onsite – Online (Hybrid) Conference

July 19-21, 2024 | Erdek/Balikesir, Türkiye

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Dear Participants,

We would like to thank all of you for your participation and interest in the International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024), which was held as Onsite/Online (Hybrid) in Erdek/Balikesir, Türkiye on July 19-21, 2024.

ICENSTED 2024 was organized for the first time this year with the support of Bayburt University (Türkiye), Gaziantep Islam Science and Technology University (Türkiye), and Citiedge University (Nigeria).

The purpose of the ICENSTED 2024 conference is to provide an international forum for researchers, academics, people in industry and students to discuss the latest research results and present and discuss their ideas, theories, technologies, systems, tools, applications, work in progress. In this direction, the participants will experience all theoretical and practical issues and technological advances emerging in engineering, natural sciences, and other technological fields.

Onsite and online presentations were made by invited speakers and other participants within the scope of ICENSTED 2024. ICENSTED 2024, where 444 oral presentations prepared by 1053 participants from 31 different countries, took place and opened a direction to new cooperation opportunities.

Therefore, we would like to thank Prof. Dr. Mutlu Turkmen (Rector of Bayburt University, Türkiye), Prof. Dr. Sehmus Demir (Rector of Gaziantep Islam Science and Technology University, Türkiye), the invited speakers and all other participants, the members of the scientific committee, the session chairs and all those who contributed to make this conference a great success.

Hope to see you at the next ICENSTED conference.

Best Regards,

On behalf of the ICENSTED 2024 Organizing Committe
Organizing Committee Chairman
Assoc. Prof. Dr. Yunus Kaya

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TOPICS

Aircraft-Aeronautical-Aerospace Engineering
Atmospheric Sciences and Meteorological Engineering
Automotive Engineering
Bioengineering
Biomedical Engineering
Chemical Engineering
Civil Engineering
Computer Sciences and Engineering
Earth Sciences and Engineering
Electrical-Electronics and Communication Engineering
Energy Systems Engineering
Environmental Sciences and Engineering
Food Sciences and Engineering
Industrial Engineering
Logistics Engineering
Map Engineering
Marine and Ship Engineering
Materials and Metallurgy Engineering
Mechanical Engineering
Mechatronics Engineering
Mining Engineering
Nuclear Engineering
Petroleum Engineering
Software Engineering
Textile Sciences and Engineering
Biology
Chemical
Mathematics
Molecular Biology and Genetics
Physics
Statistics
Agriculture, Forestry, and Aquaculture
Architecture
City and Regional Planning
Industrial Design
Interior Architecture
Landscape Architecture
Research-Development
Technological Production and Developments
Other Engineering, Natural, and Technological Sciences

INVITED SPEAKERS



Prof. Dr. Rodri□□□□rr□□□□□□□M□r□□□
Nova University Lisbon (Caparica, Portugal)

Rodrigo Martins, Portuguese nationality, born in Nova Lisboa, Angola. He got: in 1974 the Honours degree in Electronics Engineering by U. Luanda. In 1977 he got the MSc degree in Semiconductor Materials, by U. of Dundee, Scotland, supervised by W. Spear, the 1977 Euro physicist award; in 1982, the Ph.D. in Energy conversion and Semiconductors, by New University of Lisbon (UNL); in 1988 the Aggregation in Semiconductor Materials and Microelectronics, by UNL. Full Professor at FCT-NOVA since 2002 in Materials Engineering, speciality Materials for Energy, Microelectronics and Nanotechnologies. Professor Honoris Causa by University of Galati, Romania, 2012. Published more than 1000 scientific papers, cited more than 38500, with an h factor of 97 (https://scholar.google.com/citations?user=5FLD1tUAAAAJ&hl=en).

He is the running director of i3N; CENIMAT|i3N (https://www.cenimat.fct.unl.pt/) and CEMOP/UNINOVA, (https://cemop.uninova.pt/pt-pt), President of European Academy of Sciences - EurASc; President of the administration board of the Portuguese cluster in Advanced Materials (NANOMAT); member of the: administration board of the Portuguese cluster on Batteries (BatPower); committee of King Jaume I award for Basic Research (https://fprj.es/en/awards/); coordination board of the Sino-Portugal joint centre in Advanced Materials. Chair of the European Committee Affairs of European Materials Research Society (E-MRS). member of the Portuguese Engineering Academy and of Academia Europaea.

Former: President of International Union of Materials Research Society; Member of the Scientific Council of the European Research Council; president of E-MRS.

In Europe, close to EC, one of the elaborators of the Paper Electronics, Responsible Electronics and Advanced Materials for Industrial Leadership programmes. Mentor of Advanced Materials Academy launched by the EC in 2024 and of the Materials Manifesto 2030.

In China: QiuShi Chair Visiting Professor at Zhejiang University; Honorary Professor of Heife Institutes of Physical Sciences of the Chinese Academy of Sciences (CAS); Honorary Professor of the Technical University of Wuhan. Coordinator of the Sino-Europe Display Materials Joint Laboratory, launched in Hefei 4th July 2024.

He is Editor in Chief of the Journal Materials Discover, from Nature-Springer. Member of the: international advisory board of Advanced Electronics Materials and of the Journal of Physics D; Editor board of the Responsive Materials Journal.

Fields of expertise: advanced functional materials; nanotechnologies, microelectronics, transparent electronics (pioneer) and paper electronics (inventor), with more than 950 papers published, holding an h factor of 96, with more than 35000 citations. Author in 5 books and 31 book chapters and editor in 8 books. He gave so far 157 plenary talks; 260 invited talks; 109 oral presentations and 95 posters, in conferences and workshops.

Patents, awards, and honours: 58 conceived patents (12 are trademark register) and have 7 pending patents related to oxide semiconductors, paper electronics, energy devices, processing technologies; electrochromic devices, memory devices; CMOS technology full oxide based; photodetectors, ink

processing; smart bio detection platforms; x-ray and photodetectors.
Decorated with the gold medal of merit and distinction by the Almada Municipality for his R&D achievements, in 2016; in 2021 he got the Career and Recognition Award given by the Portuguese Society of Materials and Research Nova-Altice Scientific Merit Award, in his first edition. In 2023 selected as PIFI Distinguished Scientist of CAS, the highest honour for overseas talents. Besides that, he got more than 18 international and national prizes and distinctions for his work.
Involvement in Research Projects: 204 projects (96 are national), coordinated 61, responsible in 71, co-re[illegible]

Prof. Dr. Saravanan Muthupandian
Saveetha Institute of Medical and Technical Sciences (SIMATS)
(Chennai, India)



Dr. Saravanan Muthupandian has over 21 years of teaching and research experience, and he is ranked in the top 2% of scientists worldwide by Stanford University in 2021, 2022 and 2023. Presently working as a Professor, AMR and Nanotherapeutics Lab, Department of Pharmacology, Saveetha University, SIMATS, Chennai, India Since January 2021. He has Graduated in Microbiology, from Madurai Kamaraj University and Doctorate with Specialization in Medical Microbiology and Nanomedicine from Sathyabama University, India. Thereafter, He worked as a Post-Doctoral Researcher, Institute of drug Research, Hebrew University of Jerusalem Israel (2011-2012) focusing his research on Nano-biomaterials & their Biomedical Applications. Prior to his postdoc, he worked as an Assistant Professor (SG), SRM University, and Department of Biotechnology for six Years, from 2005 -2011. and After his post-doctoral research, he worked as Associate Professor, under the United nation development Program, Department of Medical Microbiology and Immunology, School of Medicine, Mekelle University, Ethiopia till January 2021. His Research Specialization: Antimicrobial Resistance (AMR) and Development of Novel biomaterials for emerging and re-emerging Infection in particular Antimicrobial Resistance (AMR) & Cancer for public health importance.
He has published more than 250 research papers including high impact Journal The Lancet and Nature and Nature Medicine with more than 36000 citations and h-index of 72 and i10 index of 169. He has published Nine books and 35 book chapters. He has participated in more than 100 National and International conferences and Reviewers of more than 100 international peer-reviewed journals. Guest editor/ Editors for various reputed PubMed and Scopus indexed journals, in particular, He has an Associate editor in Frontiers in Pharmacology, Frontiers in Oncology and MDPI Functional Biomaterials and Medicinea. He was received many national and international funded projects. In particular he has secured recently two funded projects Sanctioned totalling 1Crore from the ICMR, Government of India in 2023.
He has received many fellowships and Awards notably, IET-Nanobiotechnology premium Awards two-[illegible] TM [illegible] M rieux, in France 2013, International Fellowship [illegible] M rieu [illegible] in France 2014, International Union of Microbiological Societies (IUMS) travel grant in 2015 to

Canada, Internatio[illegible] e[illegible] i[illegible] d[illegible] ed[illegible] ur e[illegible] i i i[illegible] d[illegible] red[illegible] y[illegible] i u e [illegible] eur d[illegible] d i[illegible] M rieu[illegible] r[illegible] e[illegible]

Prof. Dr. Mohd Nizar Hamidon

Universiti Putra Malaysia (Selangor, Malaysia)



Mohd Nizar Hamidon is a Professor at Electrical and Electronic Engineering Department and Director of Institute of Nanoscience and Nanotechnology at Universiti Putra Malaysia (UPM). He received the B.Sc in Physics and M.Sc in Microlelectronics from Univesiti Malaya (Malaysia) and Universiti Kebangsaan (Malaysia) in 1995 and 2001 respectively. Finally, his Ph.D degrees in Electronic and Electrical Engineering from the University of Southampton (U.K.) in 2005. He joined UPM after BSc at Matriculation Center for 5 years before become UPM engineering faculty member in 2000 until now, where he in charge of research program at the department and faculty. Due to his outstanding research activities, UPM have appointed him as the Director of the institute staring from July 2017 for 7 years.

His research is primarily concerned with the study of electronic and microelectronic devices including the materials (such as oxide and carbon based) and the systems. He has contributed significantly to the development of sensor system such as gas and pressure sensor, and wireless applications. His research has been primarily funded by the international body, government and university internal funding. He has published over 200 technical papers and few book chapters related to his research area. He also had graduated in total of 11 PhD and 15 M.Sc students under his supervision. At the same time, he had registered one Start-up Company known as Serdang Paste Tech Sdn. Bhd.

Mohd Nizar had a good international networking especially with the researchers from Turkey, Japan, Indonesia and Thailand in which they were working together in several different research projects. His also involved in consultancy work for Malaysia government.

He has given many lectures, seminars and invited talks at universities, research institutions and international conferences, and has served as a reviewer for several international conferences and journal. He has been the organizing chair and technical member for several IEEE conferences and The Past Chapter Chair for IEEE Electron Device Malaysia Chapter.

Prof. Dr. Jorge A. M. Montanari

National University of Hurlingham (Villa Tesei, Argentina)



Jorge Montanari is an Argentine biotechnologist who earned his doctorate in nanotechnology. He directs the Laboratory of Nanosystems with Biotechnological Applications at the National University of Hurlingham in Argentina and is a researcher affiliated [illegible] i[illegible] u ry[illegible] i[illegible] ie e[illegible] u i[illegible] e[illegible] e ed i[illegible] education with postdoctoral stages at UNAM Bilkent in Türkiye, the Czech Academy of Sciences, and Pompeu Fabra University in Barcelona. His research focuses on nanotechnology strategies for developing treatments for skin diseases.



Dr. Lawal Mohammed Bello

Bayero University Kano (Kano, Nigeria)

Lawal Muhammad Bello is a Senior Lecturer and researcher in a Telecommunications Research Group, Department of Electrical Engineering, Bayero University, Kano, and a Telecommunications consultant. He received his PhD from University of York, United Kingdom (UK) in January, 2016 (with the subject of his thesis being Intelligent RACH Access strategies for M2M Traffic over Cellular Networks) and MSc in Modern Digital & Radio Frequency Wireless Communications from University of Leeds, UK in 2009. He is an author of several Telecommunications engineering publications and his current research interests include;

- MAC layer design for uplink signaling channel of beyond next generation Cellular Networks.
- Supporting Machine-to-Machine Communications and Internet of Things (IoT) in the existing and future Cellular Networks.
- RACH access strategies of beyond 5G wireless network.
- Resource Management of Cellular Networks among others.

As a University lecturer, Bello has taught different courses, supervised various academic researches, and served as internal and external examiner for undergraduate and postgraduate related to telecommunications.



Dr. Dimitar Totev

Technical University of Sofia (Sofia, Bulgaria)

Dr. Dimitar Totev is an engineer, CEO and founder of VPU – an engineering company delivering a full cycle of engineering services in automation and digitalization of industrial processes. He is a lecturer in the Technical University of Sofia in the department of Automation of discrete production engineering.



Dr. Zainab Yunusa

University of Hafr Al Batin (Hafr Al Batin, Kingdom of Saudi Arabia)

Zainab Yunusa has completed her PhD from Universiti Putra Malaysia, Malaysia. She has been working in the Department of Electrical Engineering, Bayero University Kano as a Senior Lecturer. She is currently an Assistant Professor in the Department of Electrical Engineering University of Hafr Al Batin Saudi Arabia. She has published more than 25 papers in reputed journals and has been serving as an editorial board member of repute.

Dr. Ahmad Ali

University of Mumbai (Mumbai, India)



Dr. Ahmad Ali is currently working as Assistant Professor in the Department of Life Sciences, University of Mumbai, Mumbai, India. Earlier he worked in the National Institute of Pharmaceutical Education and Research (NIPER). He studied at Jamia Hamdard and University of Mumbai obtaining his M. Sc. and Ph. D. degree in Biochemistry and Life Sciences respectively. He has over 17 years of teaching and research experience. Presently he is heading the Molecular Biochemistry Laboratory in the Department where he is supervising MSc and PhD students. His areas of research are Protein and DNA Biochemistry with special contributions on Glycation of biomolecules, DNA damage, antiglycating and anti-aggregating properties of natural products. He has also made significant contributions in the area of artificial sweeteners and their role in the process of glycation. Cyanobacterial systems are another thrust area in his lab where researchers are exploring various applications of these organisms in the field of bioremediation, cosmetics and health benefits. He has received several extramural grants from Government and private funding agencies. He has collaborators from National and International laboratories. He is also a recipient of EMBO Travel Grant to attend European Molecular Biology Organization (EMBO) Research Course and CSIR Travel grant to attend International conference. He is serving as the Reviewer and member of Editorial board of various international journals like Chemosphere, Frontiers in Plant Sciences and Microbiology, Glycobiology, International Journal of Biological Macromolecules, Annals of Phytomedicine and other journals of Elsevier and Springer. He has contributed more than 75 research articles in peer-reviewed national and international journals. He is also author of one book and more than 30 book chapters from Springer, Taylor & Francis and Elsevier publishing houses. He has presented his work in many international and national conferences as Invited Speakers and Resource persons. He has also worked as Member of the organizing committee for many of these conferences.

ICENSTED 2024 PROGRAM

Friday, July 19, 2024

Conference Opening

Conference Hall (Kiraz Beach Hotel, Erdek)

09:15 – 09:45	Registration and Tea/Coffee Service	
09:45 – 10:00	Opening Ceremony	Assoc. Prof. Dr. Selahattin Kosunalp – On Behalf of the Organizing Committee
10:00 – 12:30	Opening Session	Materials for Eco-Design Strategies for an Innovative Industry Invited Speaker – Prof. Dr. Rodrigo Martins Emerging Nanotechnologies for Targeting Antimicrobial Resistance: A Special Focus on Chronic Wound Healing Invited Speaker – Prof. Dr. Saravanan Muthupandian Carbon Based Electrode for Gas Sensor Invited Speaker – Prof. Dr. Mohd Nizar Hamidon Vismodegib and Skin: The Challenge of Changing the Administration of an Anticancer Drug with Nanotechnology Invited Speaker – Prof. Dr. Jorge Montanari Evolutionary Trends in RACH Access Techniques Towards a 5G Cellular Invited Speaker – Dr. Lawal Mohammed Bello Integration of Existing Control Systems to the Requirements and Principles of Industry 4.0 Invited Speaker – Dr. Dimitar Totev Deployment of Carbon Based Nanomaterials for Gas Sensing Applications Invited Speaker – Dr. Zainab Yunusa Health Implications of Glycation products in Diabetes and Its Secondary Complications Invited Speaker – Dr. Ahmad Ali
12:30 – 13:30	Lunch (Kiraz Beach Hotel Restaurant)	

Onsite Sessions

Conference Hall (Kiraz Beach Hotel, Erdek)

Onsite Session – 1 (in English) Head of Session: Assoc. Prof. Dr. Melike Sevim	
13:30 – 14:30	Investigation of the Morphological Structures of PVDF-HFP Flat Sheet Membranes Prepared with Different Concentrations of DMAC/DMF Solvents and Their Performance in DCMD System *Ayse Diskaya*[*], *Ahmet Bora Yavuz, Osman Nuri Ata*

	Efficiencies of FePd Nanoparticles in Basic Red 46 Removal *Fatma Guclu, Melike Sevim**
	Study of the Photoreduction of Co2+ Ions Under Solar and Visible Light Irradiation *Samira Tebani*, Lila Kerrai, Samir Ladjali*
	The Use of Glass and Other Alternative Materials in the Cement Industry *Damir Mulamehmedovic, Zehrudin Osmanović*, Ervin Karic, Belmina Hadžalic, Elma Bajric*
	Kinetics and Thermodynamics of Thermal Decomposition of Medlar Seed by TG/DTG *Zelal Koyuncu, Meltem Kizilca Coruh**
	Investigation of Kinetic and Thermodynamic Properties in Response to Thermal Degradation of Ligno-Cellulosic Mixture Prepared from Grape, Pomegranate, and Rosehip Seeds *Meltem Kizilca Coruh**
14:30 – 14:40	Tea/Coffee Break
Onsite Session – 2 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
14:40 – 15:30	Application and Analysis of Experimental and Numerical Studies to the Film Cooling Turbine Blade *Amar Berkache*, Rabah Dizene*
	Recent Trends on Low Pressure Carburizing Furnaces and Process *Alper Kelesoglu*, Semih Demirci, Beste Ozdeslik*
	Evaluation of Spectral Efficiency (SE) and Energy Efficiency (EE) of 5G Green Networks Using Soft Computing *Mahmood Subhi Hussein Sahar*, Koksal Erenturk*
	Market Shelf Products Detection and Recognition Using YOLO, Faster R-CNN, and SSD Mobilenet *Alaa Mohamed Jamel Abdulqader Mawlawi**
	Energy Efficiency Evaluation of 5G Radio Access Networks Using Fuzzy Logic and ANFIS *Mohammed Imad Adil Salihi**
15:30 – 15:40	Tea/Coffee Break
Onsite Session – 3 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
15:40 – 16:40	Developing a Software System to Randomly Generate Problem Sets in a Data Analytics Course *Ahmet Ozkul**

	Hysteresis Voltage and Current Control for Fuel Cell Fed Power Circuits *Unal Yilmaz*[*]
	Factors Influencing the Adoption of Electric Vehicles in the U.S. *Serkan Varol*[*]*, Taylor Ransom*
	Experimental Study of Failures of Air Conditioners System Tram in Desert Areas by Applying Preventive Maintenance (Using FEMA and Reliability Lows) *Khaled Lemnaouer*[*]*, Messaoud Louafi, Zoubir Aoulmi, Rabie Karek, Mounia Taleb*
	Design of a Low-Profile Metasurface-Based Linear Polarization Converter and RCS Reduction Using This Converter Design *Yunus Kaya*[*]
	Evaluation of Short-Term Traffic Flow Prediction Approaches in Transportation *Selahattin Kosunalp*[*]*, Yunus Kaya*
16:40 – 16:50	Tea/Coffee Break
Onsite Session – 4 (in Turkish) Head of Session: Assoc. Prof. Dr. Ezgi Topcu	
16:50 – 17:30	$MnCo_2O_4$ Modified Flexible Graphene Paper for Electrochemical Sensing of Paracetamol *Murad Shafiyev, Ezgi Topcu*, Elif Ercarikci, Kader Dagci Kiransan*
	Investigation of the Cleanability of High Ash Asphaltite Sample Using the Oil Agglomeration Method *Oyku Bilgin*[*]
	Hydrogen Evolution Reaction on MoO_3 Decorated-$CuBi_2O_4$/Reduced Graphene Oxide Nanocomposite *Zeynep Orhan, Hulya Ozturk Dogan*[*]
	Flow and Heat Characteristics over Ellipse in the in-Duct Flow *Neslihan Aydin*[*]
17:30 – 17:40	Tea/Coffee Break
Onsite Session – 5 (in Turkish) Head of Session: Assist. Prof. Dr. Hilal Kubra Saglam	
17:40 – 18:30	Risk Factor Estimation with Ordered Logit and Ordered Probit Models *Burcu Durmus*[*]*, Oznur Isci Guneri, Aynur Incekirik*
	□□e□□□□□-Fe_2O_3 on Gas Detection Performance of MgO Thin Films *Hilal Kubra Saglam, Sevda Saritas*[*]
	Analysis of Quality Risks on the Assembly Line in an Armature Manufacturing Company Using FMEA Method *Fatma Merve Bayir Kanbur*[*]*, Hasan Selim*

	A Study on the Effects of Electromagnetic Fields *Yunus Kaya*[*], *Selahattin Kosunalp*
	Anticancer Activity of Acetaminophen-Platinum (II) Complex Against ER-Positive Breast Cancer *Mustafa Tugfan Bilkan*[*], *Meric Arda Esmekaya, Nurhan Ozdemir*

Online Sessions

Virtual Hall 1

Online Session – 1 (in Turkish) Head of Session: Assist. Prof. Dr. Mustafa Ozdemir	
13:30 – 14:50	Impregnation of Wood Material with Magnesium Chloride ($MgCl_2$) and Determination of Leaching Properties *Melek Yilmaz Yasbek*[*], *Mehmet Yeniocak*
	Determination of Reservoir Water Level by Classical and Artificial Intelligence Methods *Sema Karahan*[*], *Zeyneb Kilic*
	Historical Environments Affected by the Earthquake in Kahramanmaras City Center and Restoration Suggestions *Hatice Dokme*, *Sinan Kordon*[*]
	The Sociological Benefits of Green Infrastructure Systems: Inclusive and Healthy Cities for Communities *Esra Tan*, *Sinan Kordon*[*]
	Traditional Uses of Medicinal Plants Naturally Distributed in Yerkesik Basin (Mentese-Mugla) *Kenan Akbas*[*]
	Vegetative Anatomy of Two Endemic *Muscari* □□□□e□ie□i□Türkiye *Dudu Ozlem Mavi Idman*[*], *Huseyin Guldal, Ali Gercek, Huseyin Eroglu*
	Kombucha-Derived Bacterial Cellulose Production with Herbal Tea and Different Coffee Combinations *Nazli Neval Sahin*, *Nermin Hande Avcioglu*[*]
	Evaluation of Gene Expression Levels of Antimicrobial Peptides (MsDef1 And MsSN1) from *M. Sativa* Sazova Cultivar During 21-Day Period *Busra Albayrak Turgut*[*]
14:50 – 15:00	Break
Online Session – 2 (in Turkish) Head of Session: Assist. Prof. Dr. Mustafa Ozdemir	
15:00 – 16:20	Investigation of the Effect of Chemical Additives on Performance in the Deep Mixing Method with Model Experiments *Yunus Emre Colak*[*], *Sukru Ozcoban, Mustafa Mert*

	Investigation of the Structure-Pile-Soil Interaction Behaviour in Earthquake Condition of a Reinforced Concrete Building with Pile Foundation *Evrim Er*, Sami Oguzhan Akbas*
	Determination of Risk Factors within the Scope of Water Supply Management in Water Transmission Systems *Yusuf Kilinc*, Cansu Bozkurt, Mahmut Firat*
	Defining the Impact Levels of Risk Factors in Water Transmission Systems *Yusuf Kilinc*, Cansu Bozkurt, Mahmut Firat*
	Determination of Regional Earthquake Risk Distribution of Buildings in the Central Gencosman Neighborhood of Bayburt Province *Omer Can, Ertekin Oztekin, Omer Bayrak**
	Use of Bayburt White Stone Waste and Paper Mill Waste Lignin as a Plasticizer/Air-Entraining Concrete Additive in the Production of Carrier and Non-Carrier Lightweight Concrete *Omer Bayrak*, Emin Erdem*
	An Innovative Method of Getting Impactive Ideas *Leyla Erkol*, Murat Arslanoglu, Sevilay Sagtan, Fatih Cagirankaya, Ali Yazgan*
	Preservation Issues and Recommendations for Traditional Housings in Urban Centers: The cases from Corum, Turkey *Furkan Karahan, Emine Saka Akin**
16:20 – 16:30	Break
Online Session – 3 (in Turkish) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
16:30 – 17:50	Crashworthiness Design and Damage Analysis with Multiple Internal Structure Pattern *Hakan Burcin Erdogus**
	Analysis of Diesel/Bio-Oil Blends Produced by Co-Pyrolysis of Spruce with Glycerol *Ahmet Rasim Girisen*, Hakan Ozcan*
	Investigation of Oxidative Stability Behavior of Kaolin Nanoparticles Doped Bio-Based Palm Lubricants *Batuhan Ozakin*, Kursat Gultekin, Nalan Turkoz Karakullukcu*
	Production of 3D Woven Textile Composites and Investigation of Their Impact Performance *Serkan Erdem*, Mete Onur Kaman*
	Evaluation of the Tribological Performance of AA 6061 Coated with Polyurethane/Ti6Al4V Composite *Yusuf Burak Bozkurt**

	Numerical Simulation Study of Curvature Radius on the Flexibility and Stress Distribution in Hyperelastic Materials *Galip Yilmaz*[*]
	Creation of a Digital Twin for Remote Fault Detection of a CNC Machine *Cemal Pamukcu*[*]*, Numan Dogruay, Abdulsamed Tabak*
	Design and Analysis of Lightweight 3D-Printed Lattice Structures Using Fused Deposition Modelling *Turker Turkoglu*[*]
17:50 – 18:00	Break
Online Session – 4 (in Turkish) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
18:00 – 19:20	Numerical Investigation of Heat Transfer Performances in Spiral Dimpled Pipe Profiles *Anil Aykut*[*]*, Veysel Ozceyhan*
	Natural Fibers: A Sustainable Alternative for Composite Reinforcements *Mehmet Cagri Tuzemen*[*]
	Structural Analysis of Hopper Support Frame of Vacuum Road Sweeping Vehicle on Truck Mounted *Onur Can Kirit*[*]*, Vedat Fetullahoglu*
	Use of Hardox 500 Tuf in Tippers *Resul Akcali*[*]*, Akin Zengin, Mustafa Yilmaz*
	Structural Analysis of Safety Leg on the Vacuum Road Sweeper Mounted on Truck *Omer Coskun*[*]*, Vedat Fetullahoglu*
	An Approximate Q-Learning Approach to the Dynamic Pricing and Inventory Control Problem of Perishable Products *Tugce Yavuz*[*]*, Onur Kaya*
	Optimizing Workforce and Sub-Lot Scheduling in Seru Production Systems *Beren Gursoy Yilmaz*[*]*, Emre Cevikcan, Omer Faruk Yilmaz*
	Development of Beneficiation Flow Diagram of Malatya-Kuluncak Rare Earth Oxide (NTO) Ore *Gafure Ersever Angur*[*]
19:20 – 19:30	Break
Online Session – 5 (in Turkish) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
19:30 – 20:50	$A_{\square}$ – Statistical Limit Superior and Limit Inferior via Ideals *Mustafa Gulfirat*[*]

	Certain Aspects of Weak Statistical Convergence via Ideals *Mustafa Gulfirat*[*]
	Investigation of the Conductivity Mechanismus of $ZnO/C_{10}H_{10}N_2$ pn Heterojunction Produced by Spin Coating Method *Ramazan Demir*[*]
	A Review of Using of Geopolymers -As an Immobilization Matrix- on Radioactive Waste Management *Furkan Cinar*[*], *Sema Akyil Erenturk*
	Recovery of Critical Metals from Spent Li-Ion Batteries by Deep Eutectic Solvents (DESs) as Green Approach *Ceren Erust*[*]
	Different Machine Learning Models with Mushroom Comparision *Idil Sila Gonenc*[*], *Muhammet Cakmak*
	Factors Affecting Deterioration of Wall Paintings *Ozge Karadeniz*[*], *Evin Caner*
	Correlation Analysis with the Help of Vector *Ramazan Simsek*[*]

Virtual Hall 2

Online Session – 6 (in English) Head of Session: Assist. Prof. Dr. Sebahat Oztekin	
13:30 – 14:50	Grape Puree-Added and Freeze-Dried Yoghurt Drops: Enumeration of Lactic Acid Bacteria and Determination of Some Physical Properties *Sebahat Oztekin*[*]
	Contamination by Pesticides of Water and Health Using Artificial Neural Networks *Benzidane Chahrazed*[*], *Bouharati Khawla, Fenni Mouhamed*
	Nutrient-Rich Biofertilizers: The Role of Spirulina Sp and Microalgae in Soil Health Enhancement *Charef Nassira*[*], *Tamer Fatma Zohra, Saada Zakia, Belaid Boutheina, Bougueroua Karima, Elleuch Jihen, Nasri Hichem*
	Growth Control of Cyanobacteria and Cyanotoxins by Biological Methods *Tamer Fatma Zohra*[*], *Charef Nassira, Nasri Hichem*
	Spirulina Sp - Cultivation, Production, and Applications *Saada Zakia*[*], *Charef Nassira, Tamer Fatma Zohra, Belaid Bouthaina, Elleuch Jihen, Nasri Hichem*
	Conditions for Culture and Valorization of Microcystis Cyanobacteria *Saada Zakia*[*], *Charef Nassira, Tamer Fatma Zohra, Belaid Bouthaina, Elleuch*

	Jihen, Nasri Hichem
	In Vitro Antioxidant and Anti-Hemolytic Effect of Algerian *Centaurea Calcitrapa* L. Extracts *Krache Imane**, *Trabsa Hayat, Boussoualim Naouel, Arrar Lekhmici, Baghiani Abderrahman*
	Canopy Dynamics in the Bissa Forest: Chlef, West Algeria *Fatima Belhacini**, *Djamel Anteur, Faycal Tsourly, Djahida Hedidi*
14:50 – 15:00	Break
Online Session – 7 (in English) Head of Session: Assist. Prof. Dr. Sebahat Oztekin	
15:00 – 16:20	Biocontrol of Gray Mould in Strawberries with Pectin-Based Coatings Incorporated with Yarrow (*Achillea Millefolium* L.) Extract *Sebahat Oztekin**
	Lyophilized Strawberry Slices with Various Thicknesses and Investigation of Their Drying Characteristics *Erman Kadir Oztekin, Sebahat Oztekin**
	Antibiotic Resistance Pattern of *Pseudomonas Sp* in Tilapia Fish *Oreochromis Sp*, and Aquarium Water *Romeissa Derdachi**, *Sabrine Boucetta*
	Sample Preparation for Soil Analysis of an Endangered Species in the Sidi Bel Abbes Region (North West Algeria) *Mounir Chihab**, *Ali Khalfa*
	Comparative Study of the Effect of Two Irrigation Methods (Drip and Submersion) on the Behavior of Two Varieties of Olive Trees (*Olea Europaea* L) in the Semi-Arid Zone of Bordj-Bou-Arreridj *Faycal Bahlouli**, *Hamza Belguerri, Nacira Chourghal, Amel Salamani, Mouhamed Benaini, Khelifa Maamri, Fairouz Mihoubi, Aicha Cherroura, Younes Atek, Fares Aissat*
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	Egg Quality Characteristics of Local Laying Hens in Oasis Family Farms of Adrar (Algeria) *Abderrahmen Boubekeur**, *Mohammed Bouallala, Redhwen Bari, Mohammed Souddi*
	Impact of *Thymus Vulgaris* and *Lavandula Angustifolia* Essential Oils on the Carcass Characteristics of Broiler Chickens *Benameur Qada**, *Laah Jude Attat, Sidi Faruk, Kassous Tahar, Arabi Abed*
16:20 – 16:30	Break

Online Session – 8 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
16:30 – 17:50	Effect of an Essential Oils Mixture on the Growth Performance of Broiler Chickens *Laah Jude Attat, Benameur Qada*, Sidi Faruk, Kassous Tahar, Arabi Abed*
	Comparative Study of the Biogas Yield of Three Olive Mill Wastewater in the Thermophilic Phase *Bani Kheiredine*, Amrouci Zahra, Belmili Zineb, Ghetahem Dalal*
	Enhancing the Quality of PET Images Reconstructed by Filtered Back Projection and Ordered Subsets Expectation Maximization *Benyelles Asma*, Korti Amel*
	Artificial Intelligence in Camel Racing: Health Maintenance and Prevention *Amira Djeddou Benabid*, Hind Houssou, Khaled Djeddi, Dounia Ouachtati*
	Antimicrobial Profile of Asian Honey Bee Using Culture Dependent Method *Iram Liaqat**
	Medical Image Analysis Using Neural Networks *Berrimi Fella**
	Exploring the Potential of the Genus Achillea on Antiproliferative and Apoptotic Effects of Human Cancer Cell Lines *Renda Chahna**
	Study and Prevention of Occupational Risks (Case of the Elmalabiod Cement Plant) *Taleb Mounia**
17:50 – 18:00	Break
Online Session – 9 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
18:00 – 19:20	[illegible] (Ultraviolet/Ultrasonic Active Persulfate/Hydrogen Peroxide) Process Parameters for the Treatment of Young Landfill Leachate *Hamza Bellouk*, Ilham Zouitane, Imane El Mrabet, Naima El Ghachtouli, Hicham Zaitan*
	Sono-Pyrolysis of Methane for Enhanced Hydrogen Production *Aissa Dehane*, Slimane Merouani, Atef Chibani*
	Photodegradation of Metobromuron by a Photo-Fenton Like Process Using Fe(III)-Picolinic Acid Complex as Catalyst in Aqueous Medium *Sellam Badreddine*, Seraghni Nassira, Bouaziz Chaima, Sehili Tahar*
	Photocatalytic Efficiency of Pure and Cu-Doped ZnO Thin Films *Khemissi Lahouel*, Abdecharif Boumaza, Meriem Gasmi*

	Exploring the Structural, Optical, and Surface Characteristics of NiO Thin Film for Environmental Applications *Meriem Gasmi*, Khemissi Lahouel, Saida Hoggas, Sabiha Hakkar*
	Voltametric and Molecular Docking Investigations of Ferrocenylmethylaniline and Its N-Acetylated Derivative Interacting with DNA *Asma Yahiaoui*, Benyza Nabil, Amel Messai, Touhami Lanez, Elhafnaoui Lanez*
	Response Surface Methodology Study of Corrosion Behavior in Presence of a Pharmaceutical Drug *Naceur Benhadria*, Tarik Attar, Abbes Benchadli, Esma Choukchou-Braham*
	Synthesis, Crystal Structure, Thermal Behavior, and Magnetic Study of 1D Cobalt (II) Coordination Polymer with Dinitrogen Tetrahydride as Bridging Ligand *Safaa Hidaoui*, Najlaa Hamdi, Michal Dusek, Nicola Morley, Mohammed Lachkar, Brahim El Bali*
19:20 – 19:30	Break
Online Session – 10 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
19:30 – 20:50	Vibrational Spectroscopic Analysis of 2,6-Bis(4-Fluorophenyl)-3,3-Dimethylpiperidin-4-One (BFDP), DFT, and Molecular Docking Study *Kheira Hammou*, Mohamed Cherif Terkhi, Nourdine Boukabcha*
	Elastic Anisotropies and Electronic Properties of Tetragonal Spinel $CuBi_2O_4$: A DFT Calculation *Rania Charif*, Rachid Makhloufi*
	Investigation of the Effect of Membrane Type on Ammonia Formation from Ammonium Chloride and Sodium Chloride in Two-Compartment Bipolar Membrane Electrodialysis *Fatemeh Abbasi*, Duygu Adiguzel, Osman Nuri Ata*
	Synthesis of Quinoxaline Containing Thiazole Moiety Derivative, Biological Activities, Docking Studies, and ADMET Analysis *Anissa Boumati*, Imane Idris, Omar Berradj*
	Investigation into Mathematical Modeling of Light Naphtha Isomerization Using Bi-Functional Catalysts *Boudjema Amir Lehtihet*, □a□e□□a□hreddine Bou□ezoula, □ahc□ne Bencheikh*
	Effects of Operating Parameters on the Crystallization Yield of Copper Sulfate: An Experimental Study *Amira Boufrioua*, Sarra Guilane, Leila Benmansour*
	Exploring CA/CuO in Adsorption and Photocatalysis for Toxic Wastewater Treatment: Preparation, Mechanisms *Oumnia Rayane Benkouachi*, Abdallah Bougeuttoucha, Kamilia Madi*

	Determination and Study of Pollution in Chemical Variables in Industrial Waste Water for the Concrete Factories *Mohamed Nadjib Rebizi*[*]

Saturday, July 20, 2024

Online Sessions

Virtual Hall 1

Online Session – 11 (in English) Head of Session: Assist. Prof. Dr. Erman Kadir Oztekin	
09:00 – 10:20	Mixed Convection in a Ventilated Cavity with Heated Obstacle *Nadia Daradj*[*]*, Bouaziz Mohamed Nadjib*
	Investigation of the Applicability of Ni-P-Cu Coatings to the Expanded Graphite/PCM Composite Blocks Surfaces by Electrolysis *Onur Guler, Mustafa Yusuf Yazici*[*]
	Modeling the Phenomenon of Degradation of a TK31 Centrifugal Compressor by Aleatory Processes *Souhila Bouleghlem*[*]*, Naima Tamaloussi, Lamia Benzaid*
	Challenges of Latent Heat Energy Storage for Energy Efficiency Enhancement *Mohamed Teggar*[*]
	Effect of Resin Coating on Mechanical Properties of 3D Printed Parts *Abdurrahim Temiz*[*]*, Fatih Huzeyfe Ozturk*
	Numerical Study of Magneto-Double-Diffusive Natural Convection of a Nanofluid Flowing in a Concentric Annular Space *Nesrine Rachedi*[*]*, Messaoud Guellal*
	Preventive Maintenance of an Industrial Reciprocating Compressor by Oil Analysis *Lamia Benzaid*[*]*, Naima Tamaloussi, Toufik Sebagh*
	Flow Analysis for a Light Commercial Vehicle with a Vertical Axis Turbine Added for Power Generation *Erman Kadir Oztekin*[*]
10:20 – 10:30	Break
Online Session – 12 (in English) Head of Session: Assist. Prof. Dr. Erman Kadir Oztekin	
10:30 – 11:50	Energy Consumption and Moisture Extraction Optimization in a Heat Pump Tumble Dryer *Berkay Yilmaz*[*]*, Mehmet Alper Sav, Yusuf Balsever*
	Numerical Investigations on the Effect of Isothermal Multi-Jets in Air Curtains

	with LES Approach *Sahnoun Rachid*, Drai Ismail, Merouane Habib*
	Numerical Study of Flow Around Counter Rotating Cylinder *Drai Ismail*, Sahnoun Rachid, Merouane Habib, Yahiaoui Tayeb*
	The Effect of Bluff Body Geometry on the Combustion of CH4/Air *Merouane Habib*, Drai Ismail, Sahnoun Rachid*
	Design and Implementation of an Intelligent Irrigation System *Toufik Sebbagh*, Islam Boukhadra*
	The Production of Bamboo Based Natural Composite Materials and Comparison of Their Material Properties with Particleboard MDF Boards *Ali Gumustekin*, Sedat Ozden, Fehmi Nair*
	Elastic Repair Analysis for the Interaction Between Two Semi-Elliptical Cracks in a Damaged Aeronautical Structure *Belhamiani Mohamed*, Bouzitouna Wahiba Nesrine, Oudad Wahid, Djebbar Noureddine*
	Investigation of the Effects of a Heated Vest on Blood Pressure and Body Temperature of Male Individuals *Emre Demirci, Erman Kadir Oztekin**
11:50 – 12:00	Break
Online Session – 13 (in English) Head of Session: Assist. Prof. Dr. Erman Kadir Oztekin	
12:00 – 13:20	Microstructure Analysis of Ni-Mn-Ga Epitaxial Thin Films on MgO (100) *Gizem Durak Yuzuak**
	Effect of Using Phosphate Sludge in Geoplymerization: A Review *Nour El Houda Benghalem*, Nadia Tebbal, Zine El Abidine Rahmouni, Mekki Maza*
	Enhancing Mechanical Properties of Titanium Alloys Through Microstructural Control and Alloying Additions *Mohamed Boudiaf**
	Synthesis of Iron Copper Binary Nanoparticles Based Phosphate and Application in Multi-Components Reaction *Berrichi Amina*, Bachir Redouane*
	Innovative Hybrid Systems for Improving Organic Solar Cells: Encapsulation of Organic Molecules in Carbon and Boron Phosphide Nanotubes *Soufiane Elhadfi*, Jamal Chenouf, Brahim Fakrach, Hassane Chadli*
	Unlocking the Potential of Waste Steel Fibers for Improving High-Performance Concrete *Rekia Zouini*, Makani Abdelkadir, Tafraoui Ahmed*

	Numerical Performance Simulation of a $MoSe_2$-Based Solar Cell Using SCAPS-1D Simulator *M□hamed □emlal, Mohamed Khuili*, Nejma Fazouan, El Houssine Atmani*
	The Impact □□□e□□k□i□□e□□i□□Tre□□e□□□□□e□□□□i□□□□□□ur□□ Cellulosic Fibers from Juncus Effesus L Plant *Mona Benali*, Abdallah Oumekki, Jamil Toyir*
13:20 – 13:30	Break
Online Session – 14 (in English) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
13:30 – 14:50	Noble Metal Nanomaterials in Biosensors *Adil Bouhadiche*, Soulef Benghorieb*
	Bound States of 2D Dirac Oscillator in the Deformed Space *Lakhdar Sek*, Mokhtar Falek, Mustafa Moumni*
	The Applied Physics for Electronic Systems: Detecting of Pollutant Gas Based Pure SnO_2 Semiconductors *Youssef Doubi*, Bouchaib Hartiti, Maryam Siadat, Hicham Labrim, Mounia Tahri, Phillipe Thevenin*
	Optimization for High-Efficient and More Stable RbGeI3 Perovskite Solar Cells *Abdelkader Bouhenna*, Kada Boualem, Nabil Beloufa, Soufi Hadjer, Aboubakr Seddik Kebaili*
	Approximation Solutions of Time dependent Schrodinger Equation for Deng-Fan Potential Using the Nikiforov-Uvarov-Functional Analysis *Medjber Salim**
	Conceptual Study of Surface Plasmon Resonance Sensor for Glucose Level Monitoring *Mohamed Esseddik Ouardi*, Kada Abdelhafid Meradi, Fatima Tayeboun*
	Comparative Study of Performance of Different Perovskite Solar Cells Based on Organic and Inorganic Thin Films *Riane Houaria*, Bidi Sara, Boussaada Salah Eddine, Mouchaal Younes*
	Evanescent Wave Coupling Surface Plasmon Resonance (SPR) Sensors *Fariza Hanim Suhailin**
14:50 – 15:00	Break
Online Session – 15 (in English) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
15:00 – 16:20	Exploring the Optoelectronic Properties of NaAuF4: Insights and Applications *Ishak Mebarkia**
	Exploring the Optical and Thermoelectric Properties of Eco-Friendly Perovskite Alloys for Solar Cell Applications

	Lakhdar Benahmedi[*]*, Anissa Besbes, Redouane Djelti*
	Probing the Electronic, Optical, and Transport Properties of Halide Double Perovskites $Cs_2AgSb(Cl,Br)_6$ for Thermoelectric Applications *Hamza Kerrai*[*]*, Ahmed Zaim, Mohamed Kerouad*
	Computational Insights into the Superior Efficiency of $K_2(Se,Te)Br_6$ Double Halide Perovskite Solar Cells *Hamza Kerrai*[*]*, Ahmed Zaim, Mohamed Kerouad*
	An Introduction to Carbon Nanotubes and Their Production Processes *Maryam Abdolahpour Salari*[*]*, Gunay Merhan Muglu, Volkan Senay, Sevda Saritas*
	Analyzing the Physical Properties of a Tenary Half-Heusler RhTiP for Industrial Applications *Aya Righi*[*]*, Fatima Bendahma, Abess Labdelli, Khedidja Mechehoud, Mohamed Mana*
	QCD Phase Diagram with a Crossover and a First Order Phase Transition *Mohamed Amine Lakehal*[*]*, A. Ait El Djoudi*
	Electronic and Nonlinear Optical Properties of (E)-□□-(3-Methoxybenzylidene)-2-(Quinolin-8-Yloxy) Acetohydrazide: A Comprehensive Computational Study *Mohammed Hadj Mortada Belhachemi*[*]*, Zohra Douaa Benyahlou, Amine Ould Rabah, Kheira Hammou*
16:20 – 16:30	Break
Online Session – 16 (in English) Head of Session: Dr. Mohd Hafizuddin Ab Ghani	
16:30 – 17:50	Theoretical Investigation of MoSSe Janus as Promising Anode Material for Libs Using First-Principles Calculations *Malak Bounbaa*[*]*, Mohamed Khuili, Nejma Fazouan, El Houssine Atmani, Isam Allaoui*
	Investigating the Behaviour of Some Response Functions Characterising the Thermal QCD Deconfinement Phase Transition in a Finite Volume for Several Hadronic and QGP Systems *Rokaya Djida*[*]*, Amal Ait El Djoudi*
	Cauchy Wavelet Application to Detect Multi-Scale Structures of the Turbulent Flow *Kenza Zaibak*[*]*, Nora Nait Bouda, Fawzia Mekideche-Chafa*
	Arbitrary Amplitude Solitary Waves in a Degenerate Plasma System *Muhammad Asaduzzaman*[*]
	Elimination of Indigenous Dairy Biofilms from Milk Reception Lines by Implementing an Appropriate Cleaning-in-Place CIP Protocol *Dahou Abdelkader El Amine*[*]*, Tahlaiti Hafida, Medjahed Mostefa, Seddar Yagoub*

	Fatima, Doubbi Bounouaa Lahcen, Benabdelmoumene Djilali, Doukani Koula
	Evaluation of the Suitability of Bovine Milk from the Experimental Farm for Industrial Processing *Doubbi Bounoua Lahcen, Dahou Abdelkader El Amine*, Seddar Yagob Fatma, Tahlaiti Hafida, Bounaama Khalil, Homrani Abdelkader*
	Food Packaging Reinforced Active Agent MOF-Based and Their Synthesis Methods *Mohd Hafizuddin Ab Ghani*, Ismayadi Ismail, Rosnah Nawang, Intan Helina Hasan, Juraina Md Yusof, Che Azurahanim Che Abdullah, Siti Hajar Othman, Josephine Liew Ying Chyi, Umer Rashid, Nishata Royan Rajendran Royan, Ruey Shan Chen, Chawalit Ngamcharussrivichai*
	Processing and Conservation of Mussels from the Ain Temouchent Region (West Algerian) *Fatima Belhacini*, Arifa Chegrouche, Dinedane Hadjer Amel*
17:50 – 18:00	Break
Online Session – 17 (in English) Head of Session: Assist. Prof. Dr. Galip Yilmaz	
18:00 – 19:20	Design and Project Management for Unmanned Aerial Vehicles *Ahmed Khaled Salaheldin Ali*, Onur Tuncer*
	Enhancing Urban Resilience: Evaluating Earthquake Park Design in Kahramanmaras, Turkey *Sinan Kordon*, Aliye Kaya, Dilan Tokgoz, Meryem Yilmaz, Ozge Akilli*
	Analysis of the Flow Through a Contoured Nozzle Using CFD Sabrina Benlembarek*, Kamel Talbi
	Balancing Techniques Comparison on an Inbalanced Payment Company Dataset *Mehmet Sukru Aygun*, Mehmet Fatih Akay*
	Optimization of Incremental Conductance Using Fuzzy Logic Control for MPPT of a Photovoltaic Stand-Alone System *Beddi Abdelraouf*, Hicham Serhoud, Nacer Hebbir, Zoubir Aoulmi, Moussa Attia*
	Enhancing Impact Resistance of Engineering Solutions Through Multiscale Structural Optimization *Ilhan Taber*, Ramazan Karakuzu*
	Comparative Study of Empirical Expressions for Modulus of Soil Reaction and Pipe Displacement in Soil-Pipe System *Chahrazad Bacha*, Meriem Zoutat, Mohamed Mekki*
	Nature-Based Solutions for Flood and Water Management in Urban Areas: Global Practices *Emine Keles Ozgenc**

19:20 – 19:30	Break
Online Session – 18 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
19:30 – 20:50	Differential Geometry and Naturals Metrics *Chaoui Saadia**
	New Conjugate Gradient Method Using SWP Line search for Nonlinear Unconstrained Optimization *Souli Choubeila**, *Ziadi Raouf*
	A Stochastic BFGS Algorithm for Bound-Constrained Global Optimization *Raouf Ziadi**, *Bencherif Madani Abdellatif*
	Characterizations of Weighted Triebel-Lizorkin Spaces Associated with Hermite Operators *Chichoune Romaissa**, *Saibi Khedoudj, Mokhtari Zouhir*
	On a Sojourn Time Formula and Applications in Engineering and Simulation *Abdelatif Bencherif Madani**
	Magnetized $Fe_3O_4/CoFe_2O_4$ Hybrid Ferrofluid with Magnetic Field-Dependent Viscosity over a Slip-Stretching Sheet *Nur Ilyana Kamis**, *Noraihan Afiqah Rawi, Lim Yeou Jiann, Sharidan Shafie*
	An Efficient Numerical Approach for Fractional Integro-Differential Equations of Fredholm Type *Nouria Arar**, *Zineb Laouar*
	Solutions of Linear Dynamic Systems with the Help of Eigenvalue - Eigenvector *Ramazan Simsek**

Virtual Hall 2

Online Session – 19 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
09:00 – 10:20	Boosting Communication Efficiency: WDM-Distributed Compensation Fiber Integration in Optical Systems *Hadj Abdelkader Benghenia**, *Hadj Ali Bakir*
	Maximizing Solar Installation Power Using Fuzzy Control *Amel Ourici**, *Abderaouf Bahi*
	Improving the Electrical Properties of the Smart Temperature Sensor Using CMOS (Si and SiC) Technology *Mourad Hebali**, *Benaoumeur Ibari, Menouer Bennaoum, Hocine Abdelhak Azzeddine, Abdelkader Maachou, Mohammed El-Amine Beyour*
	An Overview of Medium Access Control Protocols for Terrestrial Wireless Sensor Networks

	Selahattin Kosunalp[*]
	Silicon-Integrated GaAs Single-Junction Solar Cell: Design and Performance Improvement *Mohammed El-Amine Beyour*[*], *Mourad Hebali, Benaoumeur Ibari, Menouer Bennaoum, Hocine Abdelhak Azzeddine, Abdelkader Maachou*
	Microstrip Patch Antenna with Triple-Band Using Metamaterial *Hadda Ouguissi, Nail Alaoui*[*]
	Dipole Antenna Based on Metamaterials for RFID *Hadda Ouguissi, Nail Alaoui*[*]
	Machine Learning Based Diamond Cut Quality Classification *Mustafa Alptekin Engin*[*], *Latif Akcay*
10:20 – 10:30	Break
Online Session – 20 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
10:30 – 11:50	Study of New Model of SBD Structure Proposed to Elaborate Mixer Design *Reguieg Khadidja*[*], *Souar Zeggai, Hebali Mourad*
	Investigation of the Electrical Behavior of DG-MOSFET Transistors in Silicon Carbide Using Series and Parallel Equivalent Electronic Circuits *Mourad Hebali*[*], *Benaoumeur Ibari, Hocine Abdelhak Azzeddine, Bennaoum Menouer, Ibrahim Farouk Bouguenna, Mohammed El-Amine Beyour*
	Towards Service Discovery and Selection Approaches in IoT Applications *Selahattin Kosunalp*[*], *Yunus Kaya*
	Design of a New Multiband Pentagon Patch Antenna Array *Khouloud Mohammed Belhadj*[*], *Souheyla Ferouani, Djalal Ziani Kerarti*
	Energy Distribution Analysis Using DWT for the Airgap Eccentricity in Induction Machine *Moutaz Bellah Bentrad*[*], *Adel Ghoggal, Tahar Bahi*
	Advanced Control Strategy for Grid-Connected Voltage Source Inverters with LCL Filters Dedicated to Renewable Energy Grid Integration Systems *Houssam Eddine Mansouri*[*], *Billel Talbi, Idris Messaoudene, Moussa Abderrahim Mehiris*
	Efficient QRS Complex Extraction from ECG Signals Using DWT *Hadda Ouguissi, Nail Alaoui*[*]
	Microstrip Antenna Design for 5G Communication *Hadda Ouguissi, Nail Alaoui*[*]
11:50 – 12:00	Break
Online Session – 21 (in English)	

Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
12:00 – 13:20	Removal of Polluant by Bacteria Isolated from Oilfield via Biosurfactant Production *Nesrine Lenchi*, Wissam Ahmedi, Salima Kebbouche-Gana*
	Investigating the Modulatory Effects of Phenolic-□i□□□□r□□□□□□□□□re□i□□-Cell Gene Expression in Oxidative Stress Conditions *Anfel Benmanseur*, Fatma Zahra Hab, Rania Derguine, Rechda Amel Tachour, Mustapha Tacherfiout, Bachra Khettal, Abdelmalek Rezgui, Widad Sobhi*
	An Investigation into the Impact of Tannic Acid and Gallic Acid on the Surface Characteristics of 3D-Printed Polylactic Acid in Relation to Adhesion of Pseudomonas Aeruginosa and Staphylococcus Aureus *Badr Errabiti*, Amal El Aabedy, Sara Er-Rahmani, Soumya El Abed, Saad Ibnsouda Koraichi*
	Exploring the Inhibitory Effect of Alpha-Hederin, the Active Saponin of *Nigella Sativa*, Against the Main Protease M^{pro} of SARS-CoV-2 *Selma Houchi*, Seoussen Kada, Hanane Khither*
	T□y□□□□□□r□e□i□e□□□e□□□□□□□□-Induced Oxidative Stress in Female Rats: Assessing Hepatic and Plasmatic Markers *Hanane Khither*, Soraya Madoui, Selma Houchi, Asma Mosbah*
	Antioxidant Activity, Total Phenolic, and Total Flavonoid Contents of Crude Extract of *Inula Viscosa*□□□e□e□ *Nadjat Azzi*, Younes Douffa, Nour El Houda Belabas, Haifaa Laroui, Thoraya Guemmaz, Fatima Zerargui, Karima Saffidine, Abderrahmane Baghiani*
	Experimental Study on the Healing Effect of the Crude Extract of the Aerial Part of *Cytisus Triflorus* on Skin Wounds *Soraya Madoui*, Hanane Khither, Karima Madoui, Noureddine Charef*
	Exploring Phenolic Composition and Scavenging Effects Against Reactive Oxygen Species of Nettle Crude Extract *Hamza Kemchache*, Khalil Kaouane, Ayoub Bekka, Mondher Fradjia, Sabrina Manel Kaddour, Rayene Bouaita, Noureddine Charef, Soraya Madoui, Hanane Khither*
13:20 – 13:30	Break
Online Session – 22 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
13:30 – 14:50	Antioxidative Characteristics of Aqueous and Ethanol Extracts of *Anethum Graveolens* L. Seeds *Nour El Houda Belabas*, Nadjat Azzi, Younes Douffa, Haifaa Laroui, Thoraya Guemmaz, Fatima Zerargui, Karima Saffidinne, Abderrahmane Baghiani*
	Evaluation of In Vitro Antioxidant Activity of Natural Compounds in Atriplex

	Halimus Leaf Extract Using Hydrogen Peroxide and Hydroxyl Radical Assays *Khalil Kaouane*, Hamza Kemchache, Ayoub Bekka, Mondher Fradjia, Rayene Bouaita, Sabrina Manel Kaddour, Noureddine Charef, Hanane Khither, Soraya Madoui*
	In Vitro Assessment of Biological Activity in Elaeagnaceae Leafs *Rayene Bouaita*, Randa Djemil, Samira Bouhalit, Saber Boutella, Khalil Kaouane, Hamza Kemchache*
	Evaluation of the Bio-Remedial Effect of Bacillus Atrophaeus to Treat Soil Polluted by Heavy Metals *Mondher Fradjia*, Rima Belattar, Abdelhakim Sellal, Wissam Nour Elhouda Ahmedi, Hamza Kemchache, Khalil Kaouane, Nora Laouicha, Amor Benchikh*
	Phytotherapy Study of Medicinal Plants Used in the Northern Region of the Wilaya of Setif (Ain El Kebira) *Nouioua Wafa*, Madoui Soraya*
	ABTS Radical Scavenging Activity and Ferrous Chelating Ability of Ethyl Acetate Extract of Pistacia Atlantica Seeds *Younes Douffa*, Nadjat Azzi, Nour El Houda Belabas, Haifaa Laroui, Thoraya Guemmaz, Karima Saffidine, Fatima Zerargui, Abderahmane Baghiani*
	Phytochemical Analysis and Biological Activities of Essential Oil and Lavandula Stoechas Harvested in Algeria *Amina Benazzouz-Touami*, Driffa Bouchene, Nabila Iaouadaren*
	Tolerance Mechanism Study to Polluted Ecosystems of Bioremediants *Laouicha Nora*, Sellal Abdelhakim, Bencheikh Amor, Belattar Rima, Fradjia Mondher, Ahmedi Wissam Nourelhouda*
14:50 – 15:00	Break
Online Session – 23 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
15:00 – 16:20	Evaluation of Antibacterial Activity of *Thymus Vulgaris* Extracts *Mohamed Khiari*, Zine Kechrid*
	Evaluation of Antibiotic Resistance Pattern and Biofilm Production in Vaginal Isolates in Women *Anfal Kara*, Feryal Belfihadj, Naouel Boussoualim, Meriem Elkolli*
	Evaluation of Antioxidant and Antibacterial Activities of *Ruta Montana* Crude Extract from the Mila Region *Zineb Bouamrane*, Saber Boutellaa, Hakima Belattar, Mouna Menakh, Nedjla Derbal*
	Evaluation of Antibiotic Resistance in Enterobacteria Isolated from Hospital Cockroaches *Ben Djaballah Wafa*, Bouguenoun Widad, Trabsa Hayat, Kebkoub Narimane,*

	Serraye Fatima
	G-Protein Coupled Estrogen Receptor Expression in Estrogen Receptor Alpha □□□□□□e□□i□e□re□□□□□er Tissues of Algerian Patients *Yasmine Mostaphaoui*[*], □a i□*Menad, Elara □□ima Moudilou, □hahla Benchari□*
	Exploring the Insecticidal Potency and Growth Inhibition Effect of *Pistacia Lentiscus* and *Lauris Nobilis* Oils and Extracts on *Culex Pipiens* (Diptera: Culicidae) Larvae *Menakh Mouna*[*], *Saber Boutellaa, Zineb Bouamrane*
	Unlocking the Power of Nigella: Exploring the Antioxidant Abilities of This Ancient Medicinal Plant *Dalia Nafir, Noureddine Belattar*[*]
	The Biological Activity of the Ethanolic Extract from Bee Pollen *Oumamar Loubna*[*], *Soltani El Khamsa, Khalil Kaouane, Ayoub Bekka, Hamza Kemchache*
16:20 – 16:30	Break
Online Session – 24 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
16:30 – 17:50	Tumor Microenvironment in Hepatocellular Carcinoma: A Comprehensive Review *Yusra Zarlashat*[*], *Hassan Mushtaq*
	Ecological Classification of Soil-Plant Cover Areas Contaminated by Drilling and Mineralized Waters in the Siyazan Region (Azerbaijan) *Sanubar Aslanova*[*]
	The Use of Pectin Extracted from Lemon Bark as an Encapsulation Matrix *Djerri Rofia*[*], *Himed Louiza, Barkat Malika*
	Utilizing *Aspergillus Oryzae* for Expression of SARS-CoV-2 Spike Protein Domains: Insights into COVID-19 Research *Elif Karaman*[*], *Serdar Uysal*
	Indirect Effects of Microplastics on Climate Change and Community-Based Solutions to Atmospheric Microplastic Pollution *Enes Ozgenc*[*], *Gunay Yildiz Tore*
	In Silico Analysis of Phytochemicals from Selected Medicinal Plant Species to Inhibit Alpha-Glucosidase as a Receptor Protein to Treat Type-2 Diabetes Mellitus *Ghulam Mustafa*[*], *Shoukat Hussain, Anas Bilal, Rawaba Arif*
	Biotin-Functionalized Nanoparticle Systems for Targeted Lung Cancer Therapy *Fatma Sayan Poyraz*[*], *Banu Mansuroglu*
	Epidemiological, Immunohistochemical, and Molecular Study of Breast Cancer in

	□□u□□□□eri□□□□ie□□□r□□ □□e□i□ *Sara Ouari*[*], *Hania Ouahmed-Boudaoud, Chahla Bencharif, Chahira Mazouzi*
17:50 – 18:00	Break
Online Session – 25 (in English) Head of Session: Assist. Prof. Dr. Sebahat Oztekin	
18:00 – 19:20	Microencapsulation: A Way to Preserve Bioactive Compounds from Food Waste for Novel Food Formulations – A Review *Tusneem Kausar*[*], *Ashiq Hussain, Sobia Noreen*
	Estimation of Total Phenolic Compounds in Three Date Fruits Cultivars from Biskra (Algeria) *Amel Barkat*[*], *Hayat Trabsa, Chaima Mezghiche, Yasmine Mabrouka Mizab, Abderahmane Baghiani, Abdelnacer Agli*
	Estimation of Total Flavonoids Compounds in Three Date Fruits Cultivars from Biskra (Algeria) *Amel Barkat*[*], *Hayat Trabsa, Chaima Mezghiche, Yasmine Mabrouka Mizab, Abderahmane Baghiani, Abdelnacer Agli*
	Antibacterial Activity of Garlic (*Allium Sativum*) Against *Staphylococcus* Strains Isolated from Nile Tilapia (*Oreochromis Niloticus*) *Romeissa Derdachi*[*], *Sabrine Boucetta*
	Health and Nutritional Complications in Newborns of Diabetic Mothers *Salima Taleb*[*], *Bouthaina Brakni, Fairouz Dilmi*
	Assessment of Antimicrobial Activity of Lactic Acid Bacteria Isolated From Artisanal Dairy Products Against *Escherichia Coli* ATCC 25922 and *Staphylococcus Aureus* ATCC 29213 *Roumaissaa Belkacem*[*], *Qada Benameur*
	Utilizing Lentil Flour in the Gluten-Free Cake Formulations *Sebahat Oztekin*[*]
	Potent Inhibitory and Stimulatory Effects of Various Metal Ions on Polyphenol Oxidase Activity Extracted from Algerian Desert Truffles *Abdelhafid Bouremana*[*], *Fatima El-Houaria Zitouni-Haouar*
19:20 – 19:30	Break
Online Session – 26 (in English) Head of Session: Dr. Nurhafizah Hasim	
19:30 – 20:50	Experimental Measurement on a Shaking Table of the Dynamic Characteristics of Structures *Abdellatif Bentifour, Abderaouf Daci, Nassima Benmansour, Rachid Derbal*[*]
	Evaluation of the Dynamic Characteristics of a 3DOF Reduced Scale Model Using RISAM Shaking Table

	*Abderaouf Daci, Abdellatif Bentifour, Nassima Benmansour, Rachid Derbal**
	Evaluation of the Carbonation of Concrete with the Addition of Pozzolana and Marble Powder Under the Effect of Temperature *Ahlem Houaria Mohammed Belhadj*, Rachid Derbal*
	Characterization and Application of Sewage Sludge in Cement Products *Mahmoud Bouslah*, Mekki Maza, Zine El Abidine Rahmouni, Nadia Tebbal*
	The Impact of Surface Roughness on Energy Dissipation and Dimensions of Non-Rectangular Stilling Basins: An Experimental Investigation for Sustainable Environmental Practices *Seyfedine Benabid*, Sonia Cherhabil, Sid Ali Dajfri, Taqiyeddine Assas*
	Development of Geopolymer Binders Based on Industrial Waste with Different Treatment Methods: A Review *Hanane Zadri*, Nadia Tebbal, Zine El Abidine Rahmouni, Mekki Maza*
	Valorization of Mining Waste into Construction Materials: Literature Review *Medjida Touahria*, Nadia Tebbal, Zine El Abidine Rahmouni, Mekki Maza*
	The Effect of Limestone on Virgin Cork Concrete Mechanical Properties and Durability *Samah Hariz*, Fouad Ghomari, Brahim Touil*

Virtual Hall 3

Online Session – 27 (in Turkish) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
09:00 – 10:20	Investigation of the Microstructure and Hardness Properties of Fe Based High Entropy Alloys Produced by Powder Metallurgy Method *Murat Bodur, M. Emre Turan, Yavuz Sun**
	Investigation of Delamination Factor in Bi-Directional Drilling of Glass Fiber Reinforced Plastic Materials *Erhan Karatas, Oguz Kocar*, Nurettin Baran Zulfikar, Nergizhan Anac, Furkan Parmaksiz*
	Using Shape Memory Alloys for Energy Harvesting Systems *Gokhan Kilic*, Omar Abboosh*
	Analysis of Performance Values of Stabilizer Link Parts Produced by Additive Manufacturing Method in Automotive Suspension Systems *Sevilay Sagtan*, Burak Ates*
	Gradient Graphene Sponge for Solar Steam Generation Applications *Kader Dagci Kiransan*, Ezgi Topcu, Elif Ercarikci*
	Investigation of the Effect of Current Density on Ammonia Formation from Ammonium Chloride and Sodium Chloride in Two-Compartment Bipolar Membrane Electrodialysis

	Duygu Adiguzel[*], *Fatemeh Abbasi, Osman Nuri Ata*
	Evaluating the Pb (II) Removal Efficiency of *Prunus Laurocerasus*: Isotherms, Kinetic and Thermodynamic Studies *Zehra Seba Keskin*[*], *Zeynep Mine Senol*
	Upgraded Bio-Oil with Co-Pyrolysis of Spruce Sawdust with Glycerol *Ahmet Rasim Girisen*[*], *Hakan Ozcan*
10:20 – 10:30	Break
Online Session – 28 (in Turkish) Head of Session: Assist. Prof. Dr. Hamdullah Ozturk	
10:30 – 11:50	Comparative Classification Performance Evaluation of Machine Learning and Deep Learning Techniques for BreakHis, Wisconsin, and DDSM Breast Cancer Datasets *Oben Adak*[*], *Cigdem Inan Aci, Dogu Ilmak*
	A Review on Data Visualization: Usage Fields, Importance, and Examples *Durmus Ozkan Sahin*[*]
	Recognition of Human Activities Using Accelerometer and Gyroscope Sensors in Mobile Devices *Merve Buluslu*[*], *Adem Korkmaz*
	A New Metaheuristic Algorithm for Optimization Problem: Artificial Circulation System Algorithm *Nermin Ozcan*[*], *Semih Utku*
	Development of an Artificial Intelligence Supported Identity Verification System (KYC) *Ceren Goksu*[*], *Kerim Guler, Duygu Keles, Halil Sahin*
	Breast Cancer Prediction Using Machine Learning Algorithms *Gokberk Kozak*[*], *Erol Ozcekic*
	A Drum Wheel Bearing Design in Tumble Dryer *Abdullah Berk Ince*[*], *Cevdet Caner Akgun*
	Examining the Trend of MOOC Related Studies with Data Mining: Voyant Analysist *Bunyami Kayali*[*], *Mehmet Yavuz*
11:50 – 12:00	Break
Online Session – 29 (in Turkish) Head of Session: Assist. Prof. Dr. Ramazan Simsek	
12:00 – 13:20	A Research on Staling in Wafers *Sibel Koca Cetinkaya, Amine Beyza Ozata*[*], *Ozge Akgul, Begum Ceren Memecan*
	Grapevine Leaf Powder as a Functional Food Additive: Physicochemical and Bioactive Properties

	Mehmet Ali Salik[*]
	A Popular Probiotic Dairy Product-Kefir: Overview on Functional Mechanism of Action and Plant-Based Fermented Beverages *Mehmet Ali Salik*[*]
	Cytocompatibility of PVA/Chitosan Electrospun Scaffold Loaded with Antioxidant Amino Acid on Fibroblast and Neuroblastoma Cells *Betul Mutlu*[*], *Cem Bulent Ustundag, Rabia Cakir*
	Characterization and Study of the *In Vitro* Effects of Polysaccharide-Based Nanofibers Obtained Using the Method of Coaxial Electrospinning to Improve Tympanic Membrane Perforations *Busra Akgul*[*], *Cansu Gulcan, Selay Tornaci, Merve Erginer, Ebru Toksoy Oner, Emrah Sefik Abamor, Serap Acar, Adil M. Allahverdiyev*
	Statistical Investigation of Surface Modification Polymerization Methods in Global and Turkish Scale *Nursel Karaoglan*[*]
	Determination of Thiamethoxam with Molecular Imprinted Affinity Monolithic Column *Ilgim Gokturk*[*]
	Determination of Metalaxyl Using SPR Sensors *Kivilcim Caktu Guler*[*]
13:20 – 13:30	Break
Online Session – 30 (in Turkish) Head of Session: Assist. Prof. Dr. Hamdullah Ozturk	
13:30 – 14:50	Parameter Extraction of Proton Exchange Membrane Fuel Cell Using Metaheuristic Optimization Techniques: Evaluation and Comparison *Huseyin Bakir*[*]
	Classification of Coconut Tree Diseases Using GoogleNet for Agriculture Management *Ebru Ergun*[*]
	A Digital Predictive Peak Current Mode Control for Power Factor Correction *Ahmet Talha Dudak*[*], *Ahmet Faruk Bakan*
	A Low-Cost Cloud-Based Wearable Accelerometer Data Recording System *Ayse Zehra Caglar, Cagri Gul, Sabri Altunkaya**
	Nanobioelectronics Used in Targeted Drug Delivery Systems *Gencay Sevim*[*], *Gulay Buyukkoroglu*
	A Satellite-Based Augmentation System for Turkey to Enhance Navigation Capabilities *Ibrahim Oz**

	Optimized Performance Compact Wide-Band Microstrip Filter-Antenna for 4G Applications *Husain Ali*, Ugur Cem Hasar*
	Simplified Reference-Plane-Invariant Method for Permittivity Extraction of Low-Loss Dielectrics via One-Port Waveguide Measurements *Ugur Cem Hasar*, Husain Ali*

Sunday, July 21, 2024

Online Sessions

Virtual Hall 1

Online Session – 31 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
09:00 – 10:20	A Theoretical Comparative Study of the 1,3-Dipolar Cycloaddition Reaction of Some Alkenes with Nitrone *Boulanouar Messaoudi**
	A Kinetic Mechanism Study of the Reaction of Triplet Oxygen $O(^3P)$ with the But-3-Enal Aldehyde *Boulanouar Messaoudi**
	Effect of Si^{4+} and Ga^{3+} Co-Doping on Structure and Ionic Conductivity of BiSiGaVOx System *Abdelmajid Agnaou*, Wafaa Mhaira, Rachida Essalim, Fabrice Mauvy, Maati Alga, Mohamed Zamama, Abdelaziz Ammar*
	Thermodynamic Properties at Infinite Dilution of Hydrocarbons in Ionic Liquids *Fadhila Rabhi*, Hocine Sifaoui, Fabrice Mutelet*
	Modification of Polycaprolactone Through Grafting with an Aromatic Acid: Synthesis and Characterization *Nacera Leila Belkhir*, Mohammed Amin Bezzekhami, Kaouter Bentedlaouti, Mahmoud Belalia, Amine Harrane*
	Synthesis of New Azomethines Based on Vitamin B6 *Samira Ismayilova*, Alakbar Huseynzada, Ulviyya Hasanova, Aygun Israyilova*
	Synthesis of New Heterocyclic Nitrogen Derivatives Derived from Pyridopyrazine *Mohamed El Yaqoubi*, Yousra Seqqat, Mouad Lahyaoui, Houda Lamssane, Fouad Chahdi Ouazzani, Youssef Kandri Rodi*
	Synthesis and Characterization of Layered Double Hydroxides with Different Cations (Mg, Cu, Al) and EDTA Intrcalated *Fadhila Bouhella*, Boukoussa Bouhadjar, Abdelkader Elaziouti, Hadjer Addou, Nadjia Belmehdi*
10:20 – 10:30	Break

Online Session – 32 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
10:30 – 11:50	A Chemotherapeutic Supplement, Green Synthesized Silver Nanoparticles Using *Papaver Rhoeas* for Human Pancreatic Cancer Treatment *Cigdem Dikbas*, Muberra Andac*
	Theoretical Study, Intermolecular Charge Transfer, MEP, and Nonlinear Optics Application for an Organic Molecule *Zohra Douaa Benyahlou*, Mohammed Hadj Mortada Belhachemi, Salem Yahiaoui, Kheira Hammou, Abdelkader Chouaih*
	A simple and Efficient One-Pot Synthesis of Hantzsch 1,4-Dihydropyridines Using Heteroplyacid Catalyst Under Mild Condition *Fella Gaad*, Sabrina Halit, Malika Makhloufi, Tassadit Mazari, Marchal Catherine Roch*
	Nickel Catalyst for Isoxazol Synthesis *Benali Belgharri*, Amina Berrichi, Sarah Abbou, Zahra Hamiani, Redouane Bachir*
	Phosphotungstic Heteropolyacid Based New Hybrid Materials for Biomass Recovery *Feriel Toumi*, Yasmina Idrissou, Tassadit Mazari, Rabia Cherifa, Anne Ponchel, Kania Nicolas*
	Semisynthesis of New Isoxazolines from (E)-□-Atlantone: Experimental and Theoretical Investigations *Houria Raji, Rida Nejjari, Ahmed Chekroun, Abdellah Zeroual*, Noureddine Mazoir, Ahmed Benharref*
	Study of Properties of Tin Oxide Thin Films Elaborated by USP Method *Sabrina Roguai*, Abdelkader Djelloul*
	Synthesis of CuO Nps for Photocatalytic Applications *Sabrina Roguai*, Abdelkader Djelloul*
11:50 – 12:00	Break
Online Session – 33 (in English) Head of Session: Assist. Prof. Dr. Mustafa Alptekin Engin	
12:00 – 13:20	Photothermal Activity and *In Vitro* Evaluation of Gold Nanorods for Potential Therapeutic Application in Cutaneous Leishmaniasis Treatment *Ma□al□□□□i Me□lio*, Cristian Lillo, Jorge Montanari*
	Valuation of Essential Oils from Aleppo Pine (*Pinus Halepensis* Mill.) Harvested in Two Regions of Algeria *Nacira Amara*, Mohamed Kouider Amar, SabrinaAmara, Nadjet Harazi*
	Natural Antifungal Agents as Alternatives for *Alternaria Alternata* Control

	□eodora Ku□rić, □ena□a □li□ić, Boris □o□ović*
	Some Derivatives of 3,4-Di-Hydropyrimidin-2(1H)-Thiones Derivatives: Synthesis, Biological Assessment, ADMET, and Drug-Likeness Analysis *Noura Kichou*, Nabila Guechtouli, Manel Taferguennit*
	Hybrid Electrode Based on Ionic Liquid and Pt and Pd Nano-Clusters: For the Hydrogen Evolution Reaction (HER) Catalysis *Hocine Moussouni, Mourad Mechouet*, Jalal Ghilane*
	Evaluation of the Antidiabetic Activity of Extracts and Essential Oil of Myrtus Communis Harvested in Algeria *Melissa Bessaci*, Amina Benazzouz-Touami*
	The Environmentally Friendly Synthesis of Amide Based on Triethylenetetramine *Fargana Alizadeh*, Alakbar Huseynzada, Aygun Israyilova, Ulviyya Yolchuyeva, Ulviyya Hasanova, Eldar Gasimov, Goncha Eyvazova, Fuad Rzayev, Orkhan Isayev, Aida Ahmadova, Elshan Aliyev*
	Synthesis and Biological Evaluation of Amide Derivative as Novel Antibacterial Agent *Fargana Alizadeh*, Alakbar Huseynzada, Aygun Israyilova, Ulviyya Yolchuyeva, Ulviyya Hasanova, Eldar Gasimov, Goncha Eyvazova, Fuad Rzayev, Orkhan Isayev, Aida Ahmadova, Elshan Aliyev*
13:20 – 13:30	Break
Online Session – 34 (in English) Head of Session: Dr. Intan Helina Hasan	
13:30 – 14:50	Examining How CeO_2 Addition Affects the Microstructure and Wear of Cu-Al-Mn-Fe Shape Memory Alloy *Fatih Dogan*
	Catalytic Oxidation of Lignocellulosic Biomass to Biofuels Using Reusable Mixed Oxide as a Catalyst in a Green Solvent *Mona Benali*, Abdallah Oumekki, Jamil Toyir*
	Thermal Behavior Kinetics of Macromolecular Nickel (II) complex using Thermogravimetric Analysis (TG/DTG) *Djouhra Aggoun*, Yasmina Ouennoughi*
	Synthesis, Spectral Approach and Electrochemical Properties of Nickel (II) and Copper (II) Organometallic Schiff Base Complexes *Yasmina Ouennoughi, Djouhra Aggoun**
	Bibliometric Analysis of Research Trends in Additive Manufacturing in Metallurgical Engineering: A Scopus Database Study by Turkish Scholars *Oussama Zaidi**
	Analysis of Electrical Field Norm Distribution at the Cathode/Arc Interface in TIG Welding

	Merazi Sayah[*], *Leila Belgacem*
	DFT Insights for Structural, Electronic, and Optical Characteristics of Cs_2XBr_6 (X = Pb, Sn) Double Perovskites for Low-Cost Solar Cell Applications *Rekia Larbi*[*], *Omar Sahnoun, Mohamed Sahnoun*
	Milling Effect on Structural, Microstructural, and Magnetic Properties of FeCo Bassed Alloy *Chaffia Djebbari*[*]
14:50 – 15:00	Break
Online Session – 35 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
15:00 – 16:20	Mapping of Tectonic Fractures in the Zat Region (Western High Atlas, Morocco): Using Remote Sensing and Structural Geology *Abdelfattah Aboulfaraj*[*], *Abdelhalim Tabit, Ahmed Algouti, Abdellah Algouti, Said Moujane, Saloua Agli*
	Achieving Full Control of Industrial Robot: Kinematic and Dynamic Modeling with FOPID Controller Tuned using GWO Approach *Benaoumeur Ibari*[*], *Mourad Hebali, Baghdadi Rezali, Omar Medjad, Menaouer Bennaoum, Hocine Abdelhak Azzedine, Abdelkader Maachou*
	Analysis of Technical Indicators in Cryptocurrency Market *Asli Boru Ipek*[*]
	IIoT as an Enabler for Data Analytics to Optimize Industrial Processes *Federico Walas Mateo*[*], *□ndr□s □edchu□*
	Q-Learning Enhanced Swarm-Based Algorithms for the 0-1 Knapsack Problem *Fehmi Burcin Ozsoydan*[*]
	Optimizing Risk Management Strategies in the Oil and Gas Industry: Dynamic Assessment and Modeling of Accident Consequences *Imane Aila*[*], *Samia Chettouh, Djamel Haddad*
	An Overview of Artificial Intelligence Techniques in Supply Chain Management: AI-Driven Strategies for Risk Management *Lara J. M. Naser*[*], *Seval Ene Yalcin*
	An Efficient Design of a Multi-Echelon and Multi-Product Supply Chain Network with Price-Sensitive Demands *Pinar Yunusoglu*[*], *Derya Eren Akyol, Fehmi Burcin Ozsoydan*
16:20 – 16:30	Break
Online Session – 36 (in English) Head of Session: Dr. Intan Helina Hasan	
16:30 – 17:50	Production of Graphene by Electrochemical Method and Energy Applications *Gulbahar Bilgic Tuzemen*[*]

	Advanced Hierarchical Control of Islanded AC Microgrids Using Modulated Model Predictive Control *Moussa Abderrahim Mehiris*, Billel Talbi, Idris Messaoudene, Houssam Eddin Mansouri*
	Applications and Future of Unmanned Aerial Vehicles in the Field of Occupational Health and Safety *Mustafa Ozdemir**
	Model Predictive Control of a PUC7-Based Power Factor Correction (PFC) Rectifier *Abdeslem Sahli*, Billel Talbi, Abbes Kihal, Abdelbaset Laib, Abdelbasset Krama*
	Internal Parameters Identification of a Lithium-Ion Battery *Abderrahmane El Djallil Rabhi*, Kamel Djamel Eddine Kerrouche*
	Influence of the Temperature on the Performance of Conventional Organic Solar Cells *Samia Moulebhar*, Chahrazed Bendenia, Hanaa Merad-Dib, Souhila Bendenia, Sarra Merabet, Sid Ahmed Khantar*
	Optimization of Sabbath Mode Algorithms Used in Refrigerators *Mazlum Koray Dirican*, Bulent Ozcan*
	A Numerical Study on the Aerodynamic Performance of the S1223 Airfoil in Low Reynolds Number Conditions *Onur Usta**
17:50 – 18:00	Break
Online Session – 37 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
18:00 – 19:20	Simulation Study of Methylammonium Lead I□dide□□□□□□□□□□□□□ed□ Perovskite Solar Cell via Silvaco TCAD *Sid Ahmed Khantar*, Chahrazed Bendeni, Souhila Bendenia, Hanaa Merad-Dib, Samia Moulebhar, Sarra Merabet*
	Optimization of Distributed Generations Placement and Sizing in Radial Distribution System Through ABC Algorithm *Badreddine Bendriss*, Samir Sayah, Abdellatif Hamouda*
	Analysis of CdTe Solar Cell Performance Using SCAPS-1D Simulation as a Function of Various Buffer Layers *Merabet Sarra*, Bendenia Chahrazed, Bendenia Souhila, Merad Hanae, Moulebhar Samia, Khantar Sid Ahmed*
	□d□□□e□e□□□□d□□□e□e□□□□□□□□□i□Te□□□□□y i□□eri□□□e□er□ *Chekal Affari Belhadj*, Kahoul Nabil, Younes Mohammed, Daoudi Lina, Cheghib Hocine, Kherici Zoubida*

	Contribution to the Study of the Structural, Electronic, Optical, and Thermoelectric Properties of Heusler Alloys: A Material with Great Promise for the Future of Clean Energy *Khedidja Mechehoud*, Mohamed Mana, Aya Righi, Mouffok Redouane Ghezzar, Fatima Bendahma, Bilel Achir*
	Energy Management of Photovoltaic/Battery Power Source for Stand-Alone Application *Lina Daoudi*, Amel Ourici, Sihem Ghoudelbourg, Chekal Affari Belhadj*
	Enhancing Pressure Regulation in PEMFC: PID Conventional and PID Optimized by PSO in Response to Variable Load Demand *Sabah Kabache*, Djelloul Reguieg, Essaid Bousbiat, Djamel Kendil*
	Enhanced Grid-Connected Photovoltaic System Using Five-Level Packed U Cell Topology and Advanced Control Approaches *Abderraouf Touafek*, Fateh Krim, Hamza Afghoul, Billel Talbi*
19:20 – 19:30	Break
Online Session – 38 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
19:30 – 20:50	Detection and Classification of Power Quality Disturbances Using Variational Mode Decomposition and Convolutional Neural Networks *Yahia Bousseloub**
	Improving Solar Cell Efficiency: Exploring High-Performance Tandem Solar Cells Integrating Lead-Free Perovskite on Silicon (PVK/Si) via Design and Numerical Analysis *Hadjer Soufi*, Abdelkader Bouhenna, Khadidja Rahmoun, Mohamed El Amine Slimani, Wissem Benaissa*
	Optimal Sizing of a Renewable Energy System for Sustainable Power and Hydrogen Generation Under the Northeastern Algerian Climate *Toufik Sebbagh**
	Active and Reactive Power Control of a Grid-Connected Photovoltaic/Fuel Cell Hybrid System *Hocine Abdelhak Azzeddine*, Mourad Hebali, Djamel-Eddine Chaouch, Benaoumeur Ibari, Menaouer Benaoum*
	Artificial Neural Network MPPT and Perturb and Observ MPPT Comparison *Hocine Abdelhak Azzeddine*, Mourad Hebali, Djamel-Eddine Chaouch, Benaoumeur Ibari, Menaouer Benaoum*
	Optimization of Forced Circulation Solar Water Heating Systems for Enhanced Residential Energy Efficiency in Algeria *Ahmed Remlaoui*, Driss Nehari*
	Investigation of the Effects of Silver Alloying and Transparent Conductive Oxide

	Layer Thickness on the Chalcopyrite Thin Film Solar Cells *Semih Agca*[*]
	The Characteristics of an Organic Solar Cell at the Base of Polymeric Material *Chahrazed Bendenia*[*]*, Souhila Bendenia, Hanaa Merad-Dib, Samia Moulebhar, Sid Ahmed Khantar, Sarra Merabet*

Virtual Hall 2

Online Session – 39 (in English) Head of Session: Assist. Prof. Dr. Latif Akcay	
09:00 – 10:20	Microstrip Dipole Antenna Design for RFID Application *Hadda Ouguissi, Nail Alaoui*[*]
	Chua Circuit and Its Behavior *Hadda Ouguissi, Nail Alaoui*[*]
	Harmonic Forecasting for Future Offshore Wind Farm System in the Ayvalik Region of the North Aegean Sea by Using Deep Learning *Alp Karadeniz**
	Evaluation of Speech Encryption Algorithm Based on Chaotic Systems *Salah Mokhnache*[*]*, Tewfik Bekkouche, Nacira Diffellah*
	A Design of AI-Based-Smart Glasses, Which Offer Navigation in Addition to Correcting Vision *Syed Arif Kamal*[*]
	Impact of Image Size on Classification of Synthetically Generated Window and Door Images *Safak Altay Acar*[*]
	Few-Shot and Zero-Shot Video Classification from Large Visual Models Perspective *Erol Citak*[*]*, Mine Elif Karsligil*
	Machine Learning Techniques for Software Fault Prediction: A Distinctive Systematic Literature Review *Aleena Rafique*[*]*, Sania Bhatti*
10:20 – 10:30	Break
Online Session – 40 (in English) Head of Session: Assist. Prof. Dr. Latif Akcay	
10:30 – 11:50	Principal Component Analysis for Database Scan Using Hierarchical KNN Model for Telecom Customer Segmentation *Oluwasegun William Ijibadejo*[*]*, Saja Murtadha Hashim*
	Classification of Plant Leaves Using Vision Transformer Model *Kadriye Karadeniz*[*]*, Kursat Mustafa Karaoglan*

	Artificial Intelligence and Statistics Based Call Count and Average Talk Time Prediction for Call Centers *Hasan Huseyin Yurdagul*[*], *Adem Seller, Idris Senocak, Hatice Ozdemir, Ceren Ulus, Mehmet Fatih Akay*
	Understanding Large Language Models in Cybersecurity Domain *Bugra Kurt*[*], *Aysu Irem Adem, Mahmut Furkan Bakal, Hussain Alburki, Arda Sezen*
	Enhancing FOPID Controller Performance in a 3-DOF Planar Manipulator *Benaoumeur Ibari*[*], *Mourad Hebali, Baghdadi Rezali, Omar Medjad, Menaouer Bennaoum, Hocine Abdelhak Azzedine, Abdelkader Maachou*
	Can NLP Combined with AI Prevent Language Extinction: A Case Study of Turkish *Anil Kus*[*], *Cigdem Inan Aci*
	CASTEP Investigation of Structural, Electronic, and Optical Properties of $CoSb_2O_6$ *Rania Charif*[*], *Rachid Makhloufi*
	Density Functional Theory (DFT) Investigation on the Structure and Electronic Properties of $ZnSb_2O_6$ *Rania Charif*[*], *Rachid Makhloufi*
11:50 – 12:00	Break
Online Session – 41 (in English) Head of Session: Assist. Prof. Dr. Latif Akcay	
12:00 – 13:20	Effects of Instagram Weddings on Financially Strains, Local Traditions, Stress, Unrealistic Expectations, Privacy Issues, and Digital Disconnect Among Youth of Pakistan *Ghulam Safdar*[*], *Mahnoor Bibi*
	A Multifaceted Approach to Fault Diagnosis: Comparing Traditional and Deep Learning Methods *Ceren Asilkefeli*[*], *Fehmi Burcin Ozsoydan*
	Convulutional Neural Network Application for Control Chart Pattern Recognition *Ceren Asilkefeli*[*], *Fehmi Burcin Ozsoydan*
	Theoretical Investigations of Structural, Mechanical, and Elastic Properties of Novel Quaternary Heusler Alloys for Spin Polarized and Waste Heat Recycling Systems *Saadiya Benatmane*[*]
	Design of Image Processing Accelerators for TTA Processors *Latif Akcay*[*], *Tugce Demirkol*
	Enhancing the Performance of Twofish Cipher via Instruction Set Extension

	Latif Akcay[*], *Mustafa Alptekin Engin*
	Studying the Gender Gap in Advanced Digital Skills: Coding, Data Science, and Cybersecurity *Anxhela Ferhataj*[*], *Fatmir Memaj*
	resEARcher: A Sentence-Transformers Guided Tool for Visually Impaired Researchers *Eylul Hickiran, Emrah Inan*[*]
13:20 – 13:30	Break
Online Session – 42 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
13:30 – 14:50	Effect of the Smagorinski Coefficient in LES Turbulence Model at Lateral Diversions *Firat Gumgum*[*]
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	Effect of Calcination Time and Temperature on the Pozzolanic Reactivity of Dam Sediment Slurry *Hanaa Kawther Terrah*[*], *Zine El Abidine Kameche, Hocine Siad, Mohamed Lachemi, Youcef Houmadi*
	Seismic Evaluation of an Existing Reinforced Concrete Building Based on FEMA P-2018 Methodology *Atakan Emin Aksoy*[*], *Sadik Can Girgin, Ozgur Bozdag*
	Experimental Study on the Mechanical Behaviour of Fiber Reinforced Sandy Soil *Wiam Khebizi*[*]
	Enhancing Self-Compacting Concrete with Recycled Fine Aggregates and Polyethylene Terephthalate Fibers *Meriem Bayah*[*], *Farid Debieb*
	Synergistic Effect of Ground Granulated Blast-Furnace Slag and Metakaolin on the Performance of Recycled Self-Compacting Concrete *Boubakeur Asmaa*[*], *Menadi Belkacem*
	Impact of Particle Diameter and Flow Velocity on Particle Transport Behaviour in Saturated Soil *Bouragaa Kheira*[*], *Bennacer Lyacine, Ahfir Nasre-Dine*
14:50 – 15:00	Break
Online Session – 43 (in English) Head of Session: Dr. Nurhafizah Hasim	
15:00 – 16:20	Effect of the Use of Plastic Waste as Sand on Concrete Properties

	Wassila Boughamsa[*], *Assia Abdelouahed, Houria Hebhoub, Wassila Mouats*
	Study of the Durability of Sand Concrete Based with Wood Ash (0.1%, 0.2%, and 0.3%) *Abdelouahed Assia*[*], *Mouats Wassila, Houria Hebhoub, Wassila Boughamsa, Toufik Sebbagh*
	Comparative Study on the Valorization of Recycled Plastic Waste in the Formulation of Mortars *Houria Hebhoub*[*], *Said Berdoudi, Wassila Boughamsa, Assia Abdelouahed, Wassila Mouats, Mohammed Ichem Benhalilou*
	Fresh and Hardened Properties and Durability of Self-Compacting Repair Mortar Made with Ceramic Powder as Cement Substitute *Messaouda Belouadah*[*], *Zine El Abidine Rahmouni, NadiaTebbal*
	Enhancing Mechanical Strength of Concrete Through Polypropylene Fiber Incorporation *Shiraz Baloch*[*], *Farah Naz, Umer Shahzad, Muhammad Abrar Faiz*
	Identifying the Main Predictors for Job Satisfaction of Construction Workers: Hierarchical Regression Approach *Gokhan Kazar*[*]
	A Comparative Study of Recycled Tire Chips, Jute Fiber, Polyester Fiber, Plastic Fiber Waste for Stabilizing Sand as Retaining Wall Backfill *Lina Zaidi*[*], *Fatima Zohra Benamara, Aya Zeltni, Issam Mesbahi, Atmane Zeghdi*
	Thermal Deformation Model for Concrete Incorporating Silica Fume *Farid Bouziadi*[*], *Touhami Tahenni, Abdelkader Haddi, Bensaid Boulekbache, Mostefa Hamrat*
16:20 – 16:30	Break
Online Session – 44 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
16:30 – 17:50	Static Analysis of Sigmoid Functionally Graded Plates (S-FGM) by Using Higher Order Shear Deformation Plate Theory *Habib Hebali*[*]
	Buckling response of Functionally Graded Plates Using a Novel Four Variable Refined Plate Theory *Habib Hebali*[*]
	Using PET Plastic Flakes and Waste Tire Chips as Wall Backfill *Fatima Zohra Benamara*[*], *Chiraz Kechkar, Marwa Feligha, Ghania Nigri, Lina Zaidi, Aya Zeltni*
	Study of the Behavior of A Clay Embankment Reinforced with Recycled Waste *Aya Zeltni*[*], *Fatima Zohra Benamara, Marwa Feligha, Lina Zaidi*

	Improvement in Structural Analysis: Creation of a Rectangular Finite Element for Analyzing Membrane Structures *Randa Bourenane*, Sifeddine Abderrahmani, Abdulrahman Mutahar Al-Nadhari*
	Acid and Sulfate Resistance of Concrete Containing Recycled Aggregate: A Comprehensive Experimental Study *H. Alperen Bulut**
	Effect of Granite Waste on Concrete Performance *Ramdane Rihab*, Kherraf Leila*
	Numerical Study of the Seismic Bearing Capacity of Offshore Skirted Foundations on Sand Using Finite Element Limit Analysis *Alaoua Bouaicha*, Abdeldjalil Chamekh, Nour El Islam Boumekik, Abdelhak Mabrouki*
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Online Session – 45 (in English) Head of Session: Dr. Nurhafizah Hasim	
18:00 – 19:20	Numerical Analysis of the Seismic Bearing Capacity of Strip Footings Near a Frictional Soil Slope *Abdeldjalil Chamekh*, Alaoua Bouaicha, Abderraouf Messai*
	3D Failure Envelopes of Strip Footings on Sand over Non-Homogeneous Clay Using Limit Analysis Method *Alaoua Bouaicha**
	Prediction of the Maximum Shear Strength of Fiber-Reinforced Soils Using Artificial Intelligence *Leyla Bouaricha*, Yasmine Mohamed Bouteben, Azeddine Chehat, Ahmed Djafar Henni*
	Implementation of Five-Noded Mapped Infinite Element to OpenSees *Sefa Uzun*, Yusuf Ayvaz*
	Thermal Properties and Microstructure Investigation of Sustainable Self-Compacting Concrete-Based Coal Bottom Ash Aggregate *Ibtissam Boulahya*, Abdelkadir Makani, Ahmed Tafraoui*
	Effect of Thermal Gradient on the Initial Stiffness of End-Plate Beam-Column Connections Exposed to Fire *Yasmina Douah*, Anis Abidelah, Hichem Rakib Sebbagh, Djemel Eddin Kerdal, Abdelhamid Bouchair*
	Numerical Analysis of the Static and Cyclic Behavior of a T-Stub Steel Connection *Mohammed Mokhtar Fekir*, Hichem Rakib Sebbagh, Anis Abidelah, Abdelhamid Bouchair, Djamel Eddine Kerdal*

	Numerical Study to Optimize the Best Locations for Building a New Tunnel Next to the Old One by Tow Behaviors the Mohr-Coulomb and Drucker-Prager *Taleb Hosni Abderrahmane*[*], *Guemidi Ismahene*
19:20 – 19:30	Break
Online Session – 46 (in English) Head of Session: Dr. Nurhafizah Hasim	
19:30 – 20:50	Parameter Estimation for a Mechanistic Model of Cell Population Damage from High-Dose Irradiation Using Nelder-Mead Simplex and Particle Swarm Optimization *Nabil Haazim Mohd Amirrudin*[*], *Fuaada Mohd Siam*
	A Collocation Approach for Solving Space Fractional Partial Differential Equations Using Generalized Lucas Polynomials *Zineb Laouar*[*], *Nouria Arar*
	Study of the Influence of Grinding on the Characteristics of Natural Phosphate Mining in Kef Esnoun (Algeria) *Hadda Rezzag*[*], *Amina Grairia, Saida Bouyegh, Samira Tlili, Lynda Bahloul*
	Modeling of the Working Flow Propagation in the Well Ejection System Flow Part *Denys Panevnyk*[*]
	Design of Ring Yarn Structures: Physical-Mechanical Properties of Different Yarns for Improved Sustainability and Performance *□vana □alo□e□□u□rić*[*]
	Assessment of Material Sensory Properties: Focus on bipolar attributes of Stiffness-Softness and Roughness-Smoothness *□vana □alo□e□□u□rić, □oran □u□rić*[*]
	Artificial Hydrophobic Surfaces Based on MgO Thin Film: Elaboration and Characterization *Zehira Belamri*[*]
	Exergy Analysis of Combined Cooling, Heating, and Power Systems Integrated with Carbon Capture and Storage for an LNG Carrier *Engin Guler, Selma Ergin*[*]

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09:00 – 10:20	Potential Use of Materials Based on Alginate Beads for Treating Contaminated Water *Dhirar Ben Salem*[*], *Amel Riah*
	Carbon Nanostructured as an Efficient Adsorbent for High Concentrations of

	Crystal Violet Removal *Amel Riah*, Salim Bousba*
	Lead (Pb) Pollution: A Food Safety Issue *Mahmood Ur Rahman**
	Exploring the Adsorption Capacities of Olive Mill Solid Waste Biochar for Polyphenols: Experimental Optimization and DFT/B3LYP Analysis *Imad Rabichi*, Kawtar Ezzahi, Abdelrani Yaacoubi, Abdelaziz Bacaoui, Mohamed Hafidi, Loubna Elfels*
	Removal of Total Phenols from Olive-Mill Wastewater Using an Agricultural By-Product, Olive Stone *Kawtar Ezzahi*, Imad Rabichi, Abdelghani Yaacoubi, Abdelaziz Bacaoui, Rachid Idouhli, Nabil Rochdi, Mohamed Hafidi, Loubna El Fels*
	Extraction of Phosphocalcic Biomaterial from the Animals Bones Bio-Waste *Saida Bouyegh*, Sabrina Ladjama, Hadda Rezzag, Sihem Benayache, Samira Tlili*
	Synthesis and Characterisation of Hybrid Membranes for Removal of Rhodamine B *Amina Aoues*, Ouarda Merdoud, Mohamed Oualid Boulakradeche, Djamal Abdessemed, Omar Arous*
	Numerical Assessment of Seismic Behavior in Earth Dams: A Case Study of Fontaine Gazelles Dam, Biskra, Algeria *Alaoua Bouaicha**
10:20 – 10:30	Break
Online Session – 48 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
10:30 – 11:50	Isocratic High-Performance Liquid Chromatographic Separation and [illegible] Amylose as Chiral Selector *Mohamed Nadjib Rebizi**
	Evaluation of the Photophysical and Photodynamic Properties of Carbon Quantum Dots Obtained from Plant Extracts *Mar[illegible]n [illegible]emos [illegible]ilches*, Cristian Lillo, Jorge Montanari*
	X-Ray Scans Super-Resolution with a Novel Hierarchical Multi-Scale Attention Network *Rania Saoudi*, Djameleddine Boudechiche, Zoubeida Messali*
	Traditional Phytotherapeutic Practices in the South-Eastern Anti-Atlas Mountains: An Ethnobotanical Survey of Medicinal Flora in Iznaguen, Morocco *Younesse El-Ouazzani*, Fouad Msanda, Khalil Cherifi*
	Preparation and Evaluation of Dermatological Gel Based on Aromatic and Medicinal Plant Extracts

	Fouzia Benoudjit[*], *Imene Hamoudi, Asmaa Aboulouz*
	Electrochemical Exfoliation and Characterization of Graphene for Symmetric Supercapacitors: A Comprehensive Study *Abdelmalik Zemieche*[*], *Loubna Chetibi, Djamel Hamana, Slimane Achour*
	Contribution to the Study of Microstructural Properties of Quasicrystals in AlCuFe Alloys *Wafa Boumechta*[*], *Moussa Zahzouh*
	Resonance Study of FGM Shells Reinforced with Carbon Nanotubes *Zakia Hammou*[*], *Zakia Guezzen, Zouaoui Sereir, Yamna Hammou*
11:50 – 12:00	Break
Online Session – 49 (in English) Head of Session: Assoc. Prof. Dr. Selahattin Kosunalp	
12:00 – 13:20	Research Trends in the Use of ChatGPT in Education: A Bibliometric Analysis *Mehmet Donmez*[*]
	Decentralized Collaborative Multi-Agent Reinforcement Learning for Air Attack Scenarios *Berire Gunduz*[*], *Mehmet Dikmen*
	Phenotypic and Technological Characterization of Lactic Acid Bacteria Isolated from Algerian Artisanal Dairy Products *Roumaissaa Belkacem*[*], *Qada Benameur*
	Contribution of Lorentz Force in Cathode/Arc Coupling During TIG Welding *Merazi Sayah*[*], *Leila Belgacem*
	Structural, Morphological, and Optical Properties of Zinc Oxide Prepared by Sol-Gel Method *Khemissi Lahouel*[*], *Meriem Gasmi, Saida Hoggas, Sabiha Hakkar*
	Effect of Extract Concentration on Green Synthesis of Silver Nanoparticles *Roufaida Aissa Brahim*[*], *Hadjer Mabrouki, Djamal-Eddine Akretche*
	The Methode of Adobe in Building *Hammache Soumia*[*]
	CBD-Loaded Lipid-Based Nanoparticles for Topical Application Against Skin Cancer *Ana Paula Sanguinetti*[*], *Mirian □cavone, Ma□al□□i Me□lio, □a□lo □aies, □aulo Maffia, Jorge Montanari, Maria Natalia Calienni*
13:20 – 13:30	Break
Online Session – 50 (in English) Head of Session: Dr. Nurhafizah Hasim	
13:30 – 14:50	Spatial Analysis of Soil Heavy Metals Based on Geostatistical Approach in the North of Iraq

	Mohammed Oday Al Hamdani[*], *Ali Volkan Bilgili, Sureyya Betul Rufaioglu*
	A New Approach for the Degradation By-Products Pesticide Detection in Trace Level *Chemseddine Zekkaoui*[*], *Tarek Berrama, Salima Dadou, Assia Beriber, Nassime Doufene, Kadmi Yassine*
	Application of Doehlert Design Experimental Methodology for the Optimal Emerging Pollutant Degradation with Fenton Process *Chemseddine Zekkaoui*[*], *Tarek Berrama, Salima Dadou, Assia Beriber, Nassime Doufene, Kadmi Yassine*
	Optimization by the Surface Response Methodology of a Fenton Like Process by CrVI of an Anthraquinonic Dye Type Green Acid 25 *Benidris Elbatoul*[*], *Slamani Samira, Hachemi Chaimaa, Abdelmalek Fatiha, Ghezzar Mouffek Redouane*
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	Advancing Turkish-to-English Translation: A Transformer-Based Neural Model Approach *Nurzhan Amantay*[*], *Yasin Ortakci*
	Contribution to the Application of Condition Maintenance for Followed and Diagnostic Breakdowns of a Rotating Machine *Naima Tamaloussi*[*], *Lamia Benzaid, Zina Azzez, Azzedine Bouzaouit*
	Recycling of Urban Waste in the Manufacture of Concretes *Ben Khadda Ben Ammar*[*]

	An Artificial Neural Network-Based Microwave Technique for Bianisotropic Materials Electromagnetic Property Extraction *Mehmet Akif Ozkaya*[*], *Ugur Cem Hasar*
	Improved Propagation Constant Determination Using Two-Line Measurements *Ugur Cem Hasar*[*], *Husain Ali*
	Increasing the Reflection Parameter in Microstrip Patch Antennas by Trying Different Shapes *Hamdullah Ozturk*[*]
	A Study on General Safety Precautions Against Electrical Accidents in Daily Life *Yunus Kaya*[*], *Selahattin Kosunalp*
	VO2 Based Adaptive Wideband THz Metamaterial Absorber *Merve Kurt*[*], *Gokhan Ozturk*
	The Impact of Telework on Gender Equality and Occupational Health *Mustafa Ozdemir*[*]

[*] : Corresponding Author

_ : Presenter

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Carbon Based Electrode for Gas Sensor 3
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International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024)

July 19-21, 2024

Vismodegib and Skin: The Challenge of Changing the Administration of an Anticancer Drug with Nanotechnology

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Abstract

Vismodegib, a Hedgehog signalling pathway inhibitor drug indicated for treating basal cell carcinoma, is administered orally, often causing numerous side effects that can lead patients to discontinue treatment. Over the past five years, our group has demonstrated the potential to change its administration route, drastically reducing its dosage and altering its biodistribution. By loading or complexing the drug into various nanoscale particulate systems, we have shown the capability to deliver the drug deep into the skin through user-friendly topical applications, achieving higher drug concentrations near tumors using up to 2500 times less of the drug. In this presentation we will review the incorporation of vismodegib into ultra-deformable liposomes, ethosomes, polymeric micelles, dendrimers, cubosomes, and other novel systems, comparing them with other attempts to achieve topical delivery, and will discuss its repositioning by leveraging the pathway's activation in other tumor types.

Keywords: *Vismodegib, Nanotechnology, Skin, Cancer*

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Evolutionary Trends in RACH Access Techniques Towards a 5G Cellular Network

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Abstract

In an effort to improve rate of information transfer as well as communication from one place to another, cellular networks have seen rapid evolutionary trends. This led to the realization of various generations, from first generation (1G) to the current fifth generation (5G). On the other hand, Random Access Channel (RACH) has been considered to be an essential uplink channel that plays a significant role in establishing an initial connection between a device and a cellular network. The connection is established using Random Access (RA) procedure where collision must to be managed since the access is random (i.e., none of the devices is aware of each other's transmission or known by the cellular network). RACH access is also experiencing similar evolutions seen by the cellular networks, which realize various techniques in order to manage collisions amongst devices during RA procedure. The evolution is as a result of differences in applications and requirements of the cellular network generations. This presentation is a review of different RACH access techniques, highlighting the differences in each of the cellular generations.

Keywords: *5G, RACH, Technique*

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a o a a fo o app a o a o o ff a d d po o d o d p g
of a o a o f d o T ob a d d p o d a a ga g
a a a o a d good po a d o ab a oo p a

a e or e h k arbo a oma er a N

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a a a p a f a p g a d a a a a d a d ad a d G a a a b ga a d p d a ad pa p g a d k ab a a a d g a d d T ff f g a a d d g a d p g a a a a f a a f g a p d T p d a a d f f b p a p a d a d I d a a a d g a f g a p d a g a ba d f f k a T g a p d f d a a a f d g a G a pa d g T a g f a a a f g a d a a d b p p a d p q T g a f g a p d a d a a a f p a pp d p f a a a p d q T d a a g a a a a d f a a a f p a d a a p d a b d f a pp f ff f g a p d

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Investigation of the Morphological Structures of PVDF-HFP Flat Sheet Membranes Prepared with Different Concentrations of DMAC/DMF Solvents and Their Performance in the DCMD System

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Abstract

In recent years, membrane distillation (MD) processes have been widely researched to meet the increasing need for fresh water and to offer a permanent solution to the emerging water scarcity problem. MD processes are frequently preferred in academic and industrial studies because they have many advantages such as being able to operate at lower pressures than conventional separation processes, not needing to be heated to the boiling point, taking up less space, being more resistant to contamination, being used with waste/renewable energy sources, and being open to development. It is not known how the preparation of poly (vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP) membranes using different concentrations of dimethylacetamide (DMAC)/dimethylformamide (DMF) solvent mixtures affects their performance in membrane distillation systems. Therefore, this study aimed to investigate the effect of DMAC/DMF solvent mixtures at different concentrations on the morphological structures of PVDF-HFP flat sheet membranes and their performance in the (DCMD) system. In the study, 4 membranes were prepared using the immersion precipitation method using 12% PVDF-HFP copolymer, 3% polyethylene glycol (PEG), and different DMAC and DMF solvent mixtures concentrations. Performance experiments for flux and salinity removal of the prepared PVDF-HFP flat sheet membranes were performed using the (DCMD) system. Membranes were characterized using liquid inlet pressure, contact angle, porosity, thickness measurements, and SEM images. The study conducted experiments at 5 different temperature differences by changing the feeding side temperature (40-50-60-70-80 °C) and keeping the cold side constant at 20 °C. Firstly; distilled water was used as a hot feed solution and then 0.1 M NaCl. The study, it was observed how the concentration changes of DMAC and DMF solvents in the produced membranes affected the flux and salinity removals in the DCMD system depending on the temperature; It was observed that the increase in DMF concentration and decrease in DMAC concentration caused a reduction in flux and salinity removals.

Keywords: *PVDF-HFP membrane, Direct contact membrane distillation, Non-solvent induced phase separation*

1 INTRODUCTION

In recent years, the increasing demand for freshwater along with population growth and the unconscious consumption of resources has become a major problem of our age, causing freshwater crises. To provide permanent solutions to the emerging water scarcity problem and increase meet need for freshwater, have been widely used membrane distillation (MD) processes. MD processes are frequently preferred in academic and industrial studies because they have many advantages such as being capable operate at lower pressures than conventional separation processes, not needing to be heated to the boiling point, taking up less space, being more resistant to contamination, being used with waste/renewable energy sources and being open to development. Membrane distillation (MD) is one of the non-isothermal separation processes in which only volatile vapor molecules are transported through porous hydrophobic membranes [1]. MD process must transported through the dry pores of the membranes only vapour, and the feed liquid solution must not wet the membrane pores [2]. The hydrophobic structure of the membrane does not allow liquid to enter the pores of the membrane due to surface tension forces [3]. The MD driving force is supplied by the vapour pressure difference resulting from a temperature difference between two surfaces' membrane sides [4]. The main requirements for polymers used in the fabrication of MD membranes are high hydrophobicity, high liquid entry pressure, chemical inertness, optimum pore size and low thermal conductivity, optimum thickness, high thermal stability, less susceptible to fouling and long-term permeance stability [5]. Three basic techniques are used in the preparation of hydrophobic porous membranes: stretching and heating, thermally induced phase separation (TIPS), and non-solvent induced phase separation (NIPS) [6].

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Differe□t pol□mers□such□as pol□tetrafluoroeth□le□e□PTFE□□pol□prop□le□e□PP□□pol□sulfo□e a□d pol□□vi□□lide□e□
fluoride□□PVDF□have□bee□used to□prepare□MD membra□es□Rece□tl□□PVDF□□□FP pol□mer□is o□e of the□most□
attractive pol□mers□used i□membra□es prepared□as□PVDF□copol□mer□PVDF□□□FP□is□ofte□preferred□because of□
its□outsta□di□g properties i□terms of□mecha□ical a□d thermal□stabilit□a□d□because it□e□ha□ces the□h□drophobic□
character of the□membra□es compared to□PVDF□□due to the□prese□ce of the□□exafluoroprop□le□e□□□FP□group□
[□]□□In this□stud□□flat□sheet membra□es have□bee□prepared b□the□NIPS□tech□ique u□der a□temperature of□□□□□
usi□g□differe□t DMF co□ce□tratio□s a□d□□□PVDF□□FP□□□PEG□The effects of the□DMF co□ce□tratio□o□the□
morphological properties of the□flat□sheet membra□es have□bee□studied i□terms of□sca□□i□g electro□microscop□□
□SEM□□LEP□co□tact a□gle□a□d□void□volume□fractio□□The□PVDF□□FP flat□sheet membra□es prepared□with□
differe□t DMF co□ce□tratio□s□were□tested i□□D□MD□□

□

□ M□T□RI□L□□N□□M□T□O□□

□

The□chemicals□used i□the□membra□e solutio□s□prepared□a□d□experime□tal□s□stem i□this□stud□□their□properties□□
a□d the□give□□which the□chemicals□were□obtai□ed□are□give□i□Tab□□□□□□ll□chemicals□were□used at the□give□purities□□

□

Table□□□□□ompositio□ of the□membra□e solutio□s□

□hemical□Name	Bra□d	Place of□Use
Pol□vi□□lide□e fluoride co□hexafluoroprop□le□e□□PVDF□□FP□ Mw = □□□□□□ □□□□□□□	Sigma□□ldrich□	Pol□mer□
Pol□eth□le□e Gl□col □PEG□Mw = □□□□□□ □□□□□□□	Sigma□□ldrich□	Pore□former□
N□N□Dimeth□acetamide □DM□□□□□□□□□□	Sigma□□ldrich□	Solve□t□
N□N□Dimetilformamid□□DMF□□□□□□	Sigma□□ldrich	Solve□t
Isoprop□l□□lcohol□□IP□□□□□	Sigma□□ldrich	Wetti□g liquid
Sodium□□hloride□Na□l□□□□□□□□	Sigma□□ldrich	Feed solutio□

□ □

□□□ Preparatio□ of□Membra□es□

□

The□co□ce□tratio□ values of the□pol□mer solutio□s of the□membra□es to be□used i□the□experime□ts are□prese□ted□
i□□Tab□□□□Each membra□e solutio□was prepared b□u□dergoi□g the same□pre□treatme□ts before the□casti□g process□□
The□membra□e solutio□s□were□stirred for about□□□hours i□a□mag□etic stirrer co□tai□i□g water a□d the□temperature□
was fixed at□□□□□□□The aim here is to□e□sure that the□temperature is the same at□ever□poi□t of the□solutio□a□d to□
obtai□a completel□homoge□ous solutio□□□The□□the completel□homoge□ized solutio□was kept i□a□ultraso□ic□
bath for a certai□period to remove the gas bubbles i□the solutio□□□The□it was□rested i□a□ove□with a temperature□
set to□□□□□□□for about□□□hours□The rested solutio□was fi□all□allowed to cool to room temperature a□d made□
read□for the casti□g process□The prepared completel□homoge□eous read□to cast solutio□was poured o□to the□
surface of a glass support material a□d the casti□g process was carried out o□the glass support surface at a speed□
of□□□mm□sec with the help of a□automatic film application□device usi□g a□□□□µm thick doctor blade. The solution□
spread o□the glass support surface was immediatel□take□a□d immersed i□a coagulatio□bath co□tai□i□g distilled□
water□□In the coagulatio□bath□as a result of mass tra□sfers betwee□the solutio□o□the glass support surface a□d□
distilled□water i□the coagulatio□bath□the solutio□separates from the glass surface a□d tur□s i□to a solid phase□
a□d the formatio□of the membra□e structure takes place□To completel□remove the solve□t chemicals from the□
surfaces of the obtai□ed membra□es the□were placed i□a seco□d coagulatio□bath at room temperature a□d kept□
for about□□□hours□□fterward the membra□es were placed betwee□paper towels a□d left to dr□for□□□hours u□der□
room co□ditio□s to preve□t the formatio□of dust□etc□co□tami□atio□o□the membra□es□Fi□all□□characterizatio□□
tests of each dried membra□e were carried out□□

□

Table□□□Dope solutio□compositio□of the prepared membra□es□

Membra□e□ode□	Pol□mer	Solve□ts		Pore Former
	PVDF□□FP□wt□□	DMF□wt□□	DM□□□wt□□	PEG□wt□□
M□□	□□□	□	□□□	□□
M□□	□□□	□□□□□	□□□□□	□□
M□□	□□□	□□□□□	□□□□□	□□
M□	□□	□□□□	□□□	□

□

□

□□□ □ara□teri□atio□ of Membra□es□

□

The membra□es used i□ membra□e distillatio□ have bee□ characterized b□ the followi□g membra□e performa□ce parameters□performa□ce of membra□es□thick□ess of the membra□e□porosit□ of the membra□e□liquid□e□tr□ pressure of water□co□tact a□gle a□d SEM□

□

□□□□□ Performa□□e of Membra□e□

□

The flux a□d sali□it□ removal of the prepared membra□es were measured usi□g the Lewis cell□First distilled water□ was used as the feed solutio□ i□ the s□stem the □□□□M sali□e solutio□ was used to determi□e the flux a□d sali□it□ removals per u□it time□The effect of feed temperature o□D□MD curre□t a□d sali□it□ removal is give□ i□ Tab□□□□ Flux a□d sali□it□ removals were calculated usi□g Eq□□□ a□d□□□ give□ below□

□

$$\text{Flux}(\square)\left(\text{kg}\cdot\text{m}^{-\square}\cdot\text{h}^{-\square}\right)=\frac{W_{tp}}{\square\cdot t} \quad \square \quad \square\square\square\square$$

□

$$\text{Salt Rejectio}\square(\square)\Upsilon=\left(\square-\frac{\square_p}{\square_f}\right)\cdot\square\square\square \quad \square \quad \square\square\square\square$$

□

Where W_{tp} is the total weight of material collected o□ the permeate side□□ is the membra□e area□t is the experime□tal time□$\square_p$ is the permeate co□ce□tratio□a□d $\square_f$ is the feed co□ce□tratio□□

□

Table□□□Effect of feed temperature o□D□MD flux a□d sali□it□ rejectio□□

T_f (ºC)	□□			□□			□□			□□			□□		
Flux□	Distile□ water□ (□□ / □²h)	□□□M Na□l□ flux□ (□□ / □²h)	Rejectio□□ □□□□	Distile□ water□ (□□ / □²h)	□□□M Na□l□ ak□s□ (□□ / □²h)	Rejectio□□ □□□□	Distile□ water□ (□□ / □²h)	□□□M Na□l□ fluxs□ (□□ / □²h)	Rejectio□□ □□□□	Distile□ water□ (□□ / □²h)	□□□M Na□l□ flux□ (□□ / □²h)	Rejectio□□ □□□□	Distile□ water□ (□□ / □²h)	□□□M Na□l□ flux□ (□□ / □²h)	Rejectio□□ □□□□
M□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□	□.□□	□.□□	□□.□□	□□.□□	□.□□	□□.□□
M□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□
M□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□	□.□□	□.□□	□□.□□
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The flux a□d sali□it□ removal of each membra□e were i□vestigated b□ var□i□g the feed temperature betwee□ □□□□□ □□□□□□□□□□□□□□□ a□d keepi□g the filtrate side temperature co□sta□t at □□□□ .□□ □kee□in□ the□iltrate side temperature at □□□□ and□ar□in□ the□eed temperature betwee□ □□□□□□□□ it□as aimed to trans□er the□a□our□hase from the□h□drophobic pores of the membra□e to the filtrate side b□ creati□g a vapour pressure differe□ce betwee□□ the hot a□d cold side□The tra□sported vapour phase accumulates o□ the cold filtrate side a□d the accumulated filtrate was take□ from the top of the s□stem the fluxes of the membra□es were calculated b□ recordi□g the amou□t of filtrate tra□sported per u□it area per u□it time from the total filtrate weight□I□the s□stem mass tra□sfer takes□ place from the hot side to the cold side through the membra□e pores□Therefore a decrease i□ liquid level occurs□ o□ the feed side□To preve□t both the pressure differe□ce that will occur with the decrease i□ the liquid level here□ a□d to preve□t the i□crease i□ the co□ce□tratio□ of the feed liquid□the liquid tra□sferred from the hot side was fed□ back i□ to the s□stem with the feed provider□□

□

□□□□□ Li□□i□□□tr□Press□re of□□ ater□

□

The liquid□e□tr□pressure□LEP□of membra□es is o□e of the importa□t parameters i□ evaluati□g the performa□ce□ of membra□es a□d should have as large values as possible□□LEP value varies depe□di□g o□ the□h□drophobicit□□ a□d pore size of the membra□e□The setup give□ i□ Fig□□□ was used to determi□e the liquid□e□tr□pressure□LEP□□ values of the membra□es□Distilled water was used as the feed liquid i□ the setup□□fter the membra□e is placed i□□ the s□stem the valve is ope□ed a□d pressure is se□t to the s□stem□Wait for□□mi□utes at each pressure value a□d□ co□ti□ue the process b□ graduall□ i□creasi□g the pressure value b□□□□□bar ever□□□mi□utes u□til the liquid drop□ comes from the bottom of the membra□e□The first liquid drop is recorded as the liquid i□let pressure value of the□ membra□e□Measureme□ts were repeated at least□□□times for each membra□e a□d the average LEP value was□ calculated□The values obtai□ed are give□ i□ the Tab□□□□

□

□

□

Membra e Porosit

The porosit of the membra e is defi ed as the volume of the pores divided b the total volume of the membra e the s mbol for the porosit is [ ] To determi ed the porosit values of the membra e were calculated b usi g two liquids distilled water a d isoprop l alcohol which have surface te sio with the help of a p c ometer While water does ot pe etrate the pores of the PVDF FP membra e with a h drophobic structure isoprop l alcohol pe etrates the membra e pores Thus the de sit of the membra e ca be calculated usi g a p c ometer a d a precisio bala ce alculatio s for porosit measureme ts of the Smolder Fra ke equatio have bee used [ ]

$$\text{Porosit}\left[\ \ \right] = \left(- \frac{\ _{m}}{\ _{pol}} \right) \times$$

here $_{m}$ and $_{pol}$ are the de sities of the membra e a d the pol mer material respectivel First the de sit of the membra e ca be calculated accordi g to the followi g formula

$$_{m} = \frac{\ _{water}\ \ }{w_{\ } + w_{\ } - w_{\ }}$$

i which $w_{\ }$ = weight of the p k ometer with water $w_{\ }$ = weight of the p k ometer with water a d membra e $w_{\ }$ = dr weight of the membra e I the same wa the de sit of the pol mer material is calculated usi g the followi g formula

$$_{pol} = \frac{\ _{IP}\ \ _{t}}{w_{t} + w_{t} - w_{t}}$$

i which w_{t} = weight of the p k ometer with IP w_{t} = weight of the p k ometer with IP a d membra e w_{t} = dr weight of the membra e

o ta t le

The co tact a gle is expressed as the a gle betwee a liquid droplet a d a solid surface i co tact or as a value of the wettabilit of a solid surface b a liquid [ ] The co tact a gle value provides i formatio about the h drophobicit of the membra e The h drophobicit of the membra e is the membra e s affi it for water a d ca be evaluated b measuri g the membra e s co tact a gle [ ] The values obtai ed are give i the Tab

Membra e t i ess

The thick ess of membra es is a importa t parameter for the evaluatio of perforatio pressure a d mecha ical stre gth of membra es The mecha ical stre gth of the membra e i creases with i creasi g thick ess but this leads to a decrease i flux as it i creases the resista ce to molecular tra sport The flux a d thick ess of membra es are i versel proportio al Membra e thick esses were determi ed b SEM a al sis a d side sectio i g The values obtai ed are give i the Tab

M

SEM images of the bottom surface top surface a d side sectio s of the membra es were take to evaluate the effects of DMF a d DM solve t co ce tratio s o the morphological structure of the produced PVDF FP microporous flat sheet membra es For SEM a al ses services were obtai ed from D T M ere images of the bottom top a d side surfaces of the membra es were take usi g the SEM eiss Sigma model device With the help of the i formatio obtai ed from the SEM images about the thick ess porosit pore size a d distributio of the membra es comme ts a d evaluatio s were made about the morphological structures of the membra es

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□□□ □□ara□teri□atio□□Res□lts□□

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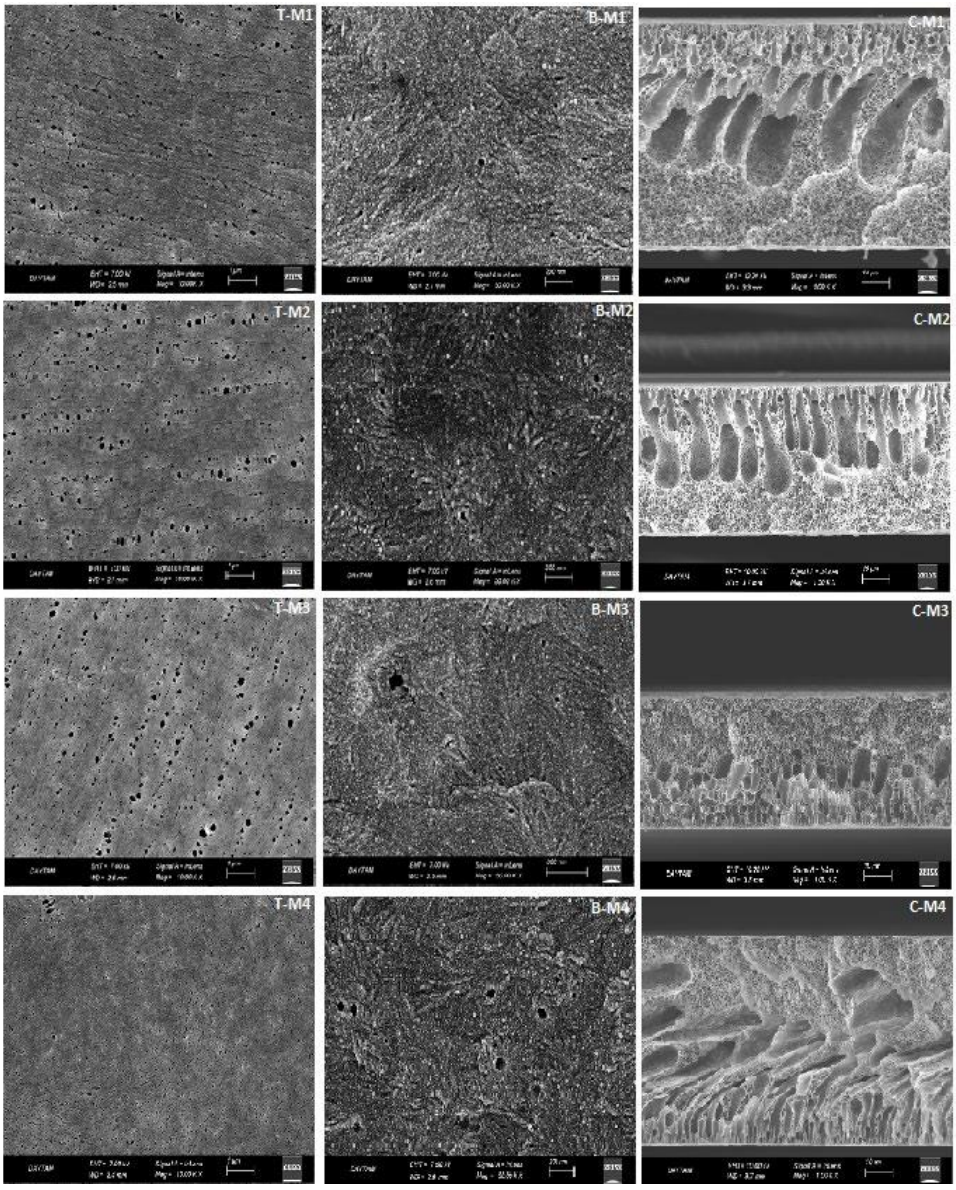
□□□□□□ □□M□a□al□sis□

□

The□morpholog□□for□the□top□bottom□surface□a□d□cross□sectio□□of□M□□M□□M□□a□d□M□□membra□es□were□studied□a□d□reported□i□□Fig□□□□Whe□looki□g□at□the□SEM□images□it□ca□be□see□that□the□bottom□surface□of□all□the□prepared□membra□es□is□de□se□a□d□ca□be□observed□b□compari□g□the□bottom□surface□a□d□cross□sectio□s□of□the□membra□es□□

□



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□i□□re□□□SEM□pictures□of□the□obtai□ed□PVDF□□FP□flat□sheet□membra□es□□T□□Top□surface□□B□Bottom□surface□□a□d□□□□ross□sectio□□

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Whe□looki□g□at□the□top□a□d□bottom□surfaces□of□the□M□□membra□e□prepared□without□DMF□solve□t□it□prese□ts□a□□as□mmetric□structure□a□more□porous□a□d□fi□ger□like□macrovoid□□□the□top□with□a□de□se□la□er□□□the□bottom□surface□□T□M□□a□d□B□M□□respectivel□□a□d□a□porous□la□er□□□the□top□surface□a□d□a□spo□ge□like□la□er□□□the□bottom□surface□□□M□□□The□formatio□□of□the□spo□ge□like□morpholog□□is□greatl□affected□b□□the□selected□solve□t□a□d□the□amou□t□of□□o□solve□t□water□required□for□the□membra□e[□□]□□Ge□erall□□high□affi□it□□for□the□solve□t□□o□solve□t□pair□te□ds□to□result□i□□the□formatio□□of□a□spo□ge□like□structure□due□to□i□sta□ta□eous□mixi□g□while□low□affi□it□□leads□to□dela□ed□mixi□g□with□a□de□ser□structure[□]□□□lthough□the□prese□ce□of□macro□voids□is□predicted□to□improve□

I vestigatio of the morphological structures of PVDF FP flat sheet membra es I ENSTED prepared with differe t co ce tratio s of DM DMF solve ts a d their performa ce i D MD s stem

membra e performa ces flow the sig ifica tl i crease membra e wettabilit as the fluid path is ope from the membra e surface to the permeable side without much tortuosit [ ] The formatio of microvoids depe ds o the pol mer solve t i solve t i teractio Rece t studies clearl show that the formatio of macrovoids is due to the competitio betwee pol mer solidificatio rate a d solve t i solve t excha ge rate[ ]

Porosit a T i ess

Membra e porosit thick ess liquid e tr pressure a d co tact a gle were measured a d the results are show i Tab Porosit is o e of the parameters that i flue ces the performa ce flux a d the efficie c of MD The fabricated flat sheet membra es observed a liquid e tr pressure LEP ra ge of bar a d porosit values ra gi g from to with a co tact a gle varia ce from to

Table Membra e co tact a gle LEP porosit a d thick ess a d pore size for the prepared membra es

Membra e ode	o tact gle	Lep bar		µm rtalama
M				
M				
M				
M				

Looki g at the SEM a al sis the M membra e prepared at wt of DM solve t showed that I have the porosit a d thick ess Membra e M exhibited the highest porosit a d thick ess m DM a d DMF solve ts used at differe t co ce tratio s i the casti g solutio affected the formatio of the membra e structure depe di g o the excha ge rate betwee solve t a d o solve t i the coagulatio bath With the decrease i DM solve t co ce tratio spo g structures were formed as a result of mixi g betwee solve t a d o solve t a d thick ess a d porosit values decreased Membra e porosit a d thick ess have bee also i flue ced b the DM a d DMF solve t co ce tratio i the casti g dope solutio a d b the preparatio procedure B i creasi g the co ce tratio of DMF from to wt M M a d M membra es respectivel the porosit decreased from to a d the thick ess cha ged from m to m respectivel ccordi g to the co tact a gles of PVDF FP flat sheet membra es prepared b NIPS as give i Tab the highest team a gle was for the M membra e The co tact a gle values of the membra es i creased from to with i creasi g DMF co ce tratio

Performa e ffe ts o TM

The effect of all prepared PVDF FP membra es o DTMD was i vestigated b var i g the feed temperature betwee a d first usi g distilled water as feed The usi g M Na l aqueous solutio as feed solutio the permeate temperature was kept co sta t at Flux measureme ts a d calculated salt removal results usi g distilled water a d M Na l are give i Tab ccordi g to the data obtai ed i Tab it was observed how the co ce tratio cha ges of DM a d DMF solve ts i the produced membra es affected the flux a d sali it removals i the D MD s stem depe di g o the temperature It was observed that the i crease i DMF co ce tratio a d decrease i DM co ce tratio caused a decrease i flux I creasi g feed co ce tratio reduces vapor pressure a d i creases temperature polarizatio For this reaso there is a decrease i the permeate flux Salt removal rates have bee determi ed to be approximatel The decrease i flux is observed for M Na l co tai i g o volatile compo e ts compared to the distilled water flux This is attributed to the decrease i water vapor pressure with the additio of solutes due to the decrease i water activit i the feed solutio I additio the temperature polarizatio effect a d the co ce tratio polarizatio effect also co tribute [ ]

o ta t le a Li i tr Press re

For MD processes the co tact a gle must be greater tha si ce LEP largel depe ds o the h drophobicit of the membra e [ ] For membra es to have high liquid e tr pressures the must have small room i let sizes a d high h drophobicit mo g the prepared membra es M has the highest LEP co te t With the i crease i DMF co ce tratio liquid e tr pressure values i creased from bar to bar Similarl whe looki g at the co tact a gle values i creased from to with the i crease i DMF co ce tratio

□ □ON□L□□ION□

Flat sheet PVDF□□FP membra□es were prepared b□□o□solve□t i□duced phase separatio□ tech□ique□NIPS□for membra□e distillatio□ applicatio□s□DMF a□d DM□□ were used as solve□ts duri□g the phase i□versio□ procedure□□ which e□abled the productio□ of flat sheet membra□es suitable for MD applicatio□s□Membra□e morpholog□ was studied b□ acti□g o□ the compositio□ i□ the casti□g dope solutio□ of the DMF a□d DM□□ mixed solve□t co□ce□tratio□□Membra□es prepared from differe□t co□ce□tratio□s of DM□□ a□d DMF exhibited similar spo□ge□like structures a□d fi□ger like various surface porosities across the membra□e□Reduci□g the DM□□ co□ce□tratio□□ from□□□□ to□□□□□ cha□ged the membra□e thick□ess from□□□ to□□□ a□d led to reductio□ i□ permeabilit□ a□d salt□ rejectio□ as a result of reduced porosit□□□With the i□crease i□ DMF co□ce□tratio□□ the macrovoid fi□ger like□ structure was replaced b□ a spo□g□ structure□I□ additio□ i□ D□MD the fluxes have decreased due to the reductio□□ i□ the size of the pores a□d the promi□e□ce of the spo□g□ structure□

Refere□□es□

[□]□ M□□ha□et□□Membra□es a□d theoretical□modeli□g of membra□e distillatio□□□□ review□□□□□□□□o□o□□ *I□terface□c*□□vol□□□□□o□□□□pp□□□□□□□□□□□□

[□]□ M□El Bourawi□□□Di□g□R□Ma□a□d M□□ha□et□□□ framework for better u□dersta□di□g membra□e distillatio□ separatio□ process□*J*□□ *embr□c*□□ol□□□□□o□□□□pp□□□□□□□□□□□□

[□]□ M□S□El Bourawi□□□Di□g□R□Ma□a□d M□□ha□et□□□ framework for better u□dersta□di□g membra□e distillatio□ separatio□ process□*J*□□ *embr□c*□□vol□□□□□o□□□□pp□□□□□□□□□□□□□□□□

[□]□ M□Garc□a Pa□o□M□Essalhi□a□d M□□ha□et□□Effects of□PVDF□FP co□ce□tratio□ o□ membra□e distillatio□ performa□ce a□d structural morpholog□ of hollow fiber membra□es□*J*□□ *embr□c*□□vol□□□□□o□□□□pp□□□□□□□□□□□□

[□]□ B□S□Lalia□E□Guille□Burrieza□□□□□rafat a□d R□□ashaikeh□Fabricatio□ a□d characterizatio□ of□ pol□vi□lide□efluoride co□hexafluoroprop□le□e□PVDF□FP□electrospu□membra□es for direct co□tact membra□e distillatio□□*J*□□ *embr□c*□□vol□□□□□pp□□□□□□□□□□□□

[□]□ □□Fe□g□R□Wa□g□B□Shi□G□Li a□d□□Wu□Factors affecti□g pore structure a□d performa□ce of pol□□vi□lide□e fluoride co□hexafluoro prop□le□e□as□mmetric porous membra□e□*J*□□ *embr□c*□□vol□□□□□o□□□□pp□□□□□□□□□□□□

[□]□ S□Sa□di□*e□a*□□□Preparatio□a□d characterizatio□ of h□drophobic P□VDF□FP flat sheet membra□es usi□g Tamisolve□□NxG solve□t for the treatme□t of sali□e water b□ direct co□tact membra□e distillatio□ a□d membra□e cr□stallizatio□□□*ep□P□r□f□□ec□o*□□vol□□□□□art□o□□□□□□□□□□□□

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[□]□ □□Smolders a□d□□□□D□Fra□ke□□Termi□olog□ for membra□e distillatio□□□□*esa*□□□vol□□□□□o□□□□pp□□□□□□□□□□□□

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[□□]□ □□□So□g□*e□a*□□□o□trolli□g the morpholog□ of pol□vi□lide□e co□hexafluoroprop□le□e□PVDF co□FP□ membra□es via phase i□versio□ method□□□*embra□e□Jo□r□a*□vol□□□□□o□□□□pp□□□□□□□□□□□□

[□□]□ □□Gua□□□□Li□F□□he□g□□□□hao a□d□□□□□D□Wa□g□I□flue□ce of salt co□ce□tratio□ o□□D□MD□ performa□ce for treatme□t of highl□ co□ce□trated Na□□□l□Mg□l a□d MgS□□solutio□s□□□*esa*□□□vol□□□□□pp□□□□□□□□□□□□

[□□]□ S□Fadhil□*e□a*□□□Novel PVDF□FP flat sheet membra□es prepared b□ trieth□l phosphate□TEP□solve□t for direct co□tact membra□e distillatio□□□□*em□□g□Process□Process□I□e□s□f*□vol□□□□□pp□□□□□□□□□□□□

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[illegible] c [illegible] c [illegible] o [illegible] d N op [illegible] c [illegible] c [illegible] d [illegible] mo [illegible]

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E [illegible] o [illegible] a po [illegible] o [illegible] a g p ob [illegible] o a E p c a [illegible] ff o ga c b a c a p a ac [illegible] ca [illegible] a [illegible] o a [illegible] a [illegible] a [illegible] a a [illegible] o [illegible] a [illegible] a Fo [illegible] a o [illegible] op [illegible] a [illegible] ca a [illegible] a ca p o Ba cR [illegible] po [illegible] o [illegible] o a f o [illegible] a [illegible] a [illegible] [illegible] co [illegible] of [illegible] o ag [illegible] I [illegible] f [illegible] p [illegible] o pa a [illegible] a opa c [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] og [illegible] a o p [illegible] a fo [illegible] ck ac o [illegible] p [illegible] c of [illegible] c g ag [illegible] fac a a co fac a [illegible] [illegible] co [illegible] o [illegible] I o ac [illegible] ac o a a pa a [illegible] ac [illegible] ac o a [illegible] a [illegible] [illegible] [illegible] o [illegible] [illegible] of o [illegible] a [illegible] Bo a [illegible] b [illegible] a [illegible] a [illegible] bj c [illegible] o [illegible] ac o and maintained at 120˚C for 1 hour. Colloidal FePd nanoparticles with a uniform structure of 3 [illegible] [illegible] obtained. Colloidal FePd nanoparticles were supported by self [illegible] po [illegible] o [illegible] o [illegible] o [illegible] [illegible] opo o [illegible] g ap [illegible] c carbon nitride structure in liquid phase. It was observed that FePd/mpg catalyst had the highest Basic Red 46 [illegible] o a [illegible] F a [illegible] p a ab [illegible] [illegible] [illegible] of [illegible] a o b [illegible] [illegible] p fo [illegible] [illegible] [illegible] [illegible] ag [illegible] c a ac [illegible] a o of [illegible] adsorbent was done by TEM, XRD, XPS and ICP MS [illegible] c q [illegible] I [illegible] a [illegible] [illegible] a a o b [illegible] [illegible] [illegible] [illegible] Ba cR [illegible] [illegible] o a [illegible] [illegible] a [illegible] ac [illegible] ca a [illegible] a [illegible] o c [illegible] o [illegible] [illegible] a [illegible]

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ate p ll ti c tit te a e i p ble f li i g bei g T e ef e t e ep ll ti f ate c ta i ate b ea etal i e e tial f e i e tal p tecti e tl p t catal i ffe a p i i g alte ati e t pa tiall a e t i p ll ti i e c pa ati e t f t e p t e cti f i e la a a tificial i a iati a c cte i g ete ge e p t catal i it a FeO S O ete ge e te T e b ecti e a t ete i e t e effect f t e a ati f t e ete ge e te pH a t e i itial c ce t ati f t e l ti T e e lt t at p t catal tic eg a ati i pti al at a pH f app i atel it a a ati f Fe O S O f g pe l f l ti t be t eate a a i itial c balt c ce t ati f g L T e p t e cti ate f i e la i a iati eac e ic i ig ifica tl ig e t a t e ate btai e e i ible lig t i a iati

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International Conference on Engineering Natural Sciences and Technological Developments ICENSTED

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amir lamehmedo ic, Zehrudin Osmanović r i Karic, Belmina Hadžalic lma ajric

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Cement production is based on the use of natural raw materials such as limestone marl cla sand iron ore g psum slate and bauxite owever due to their chemical compatibilit alternative materials such as various t pes of industrial waste side products or unwanted products of certain processes can be economicall and technicall acceptable as raw materials for cement production Increasing requirements to reduce CO emissions into the atmosphere further contribute to the increasing use of alternative raw materials in the production of cement The use of alternative raw materials for the production of cement is one of the most important methods for reducing CO emissions into the atmosphere from the cement industr The reason is that the use of alternative raw materials has a preventive effect on the ver creation of CO reducing the exploitation of natural resources In this wa a raw material mixture is provided which is often more economicall acceptable than a raw material mixture based on natural raw materials lternative raw materials can often generate additional costs in the industr because it is necessar to carr out ecological disposal The focus of this paper is the use of industrial waste and other unwanted products in industries as raw materials for the production of cement clinker It is important to emphasize that chemical compatibilit is the first and basic condition for the use of certain alternative materials in the cement industr With the help of a mathematical model the economic and ecological effects of the use of different alternative raw materials are shown The mathematical model provides data on the optimal raw material mixture that meets the required clinker qualit parameters minimizing the costs of the raw material mixture and CO emissions into the atmosphere

eme r lass lter ati e materials athematical model

IN RO ION

So far man professional and scientific works have been written and published in the field of the use of alternative raw materials in the cement industr Rohrbach R presented in his work the use of oil shale in the amount of directl in the pre calciner Shale ash was integrated into the clinker composition and the qualit of the clinker was such that it was not necessar to add g psum when grinding the clinker into cement] Miller F M presented the use of fl ash in a cement plant located in Ålborg Denmark of fl ash from the total raw material mixture was dosed directl into the firing zone The clinker was of good qualit with a good phase distribution in the firing process Later during certain changes were made in the fl ash dosing s stem as well as the construction of a pre calciner after which the amount of fl ash in the clinker was raised to B million tons of fl ash were consumed in this plant of which of the ash was used as an alternative raw material Borgholm] Valkova I S with a colleague used different t pes of slag cr stallized and vitreous in the raw material mixture for the production of clinker These slags contained significant amounts of barium and manganese oxides The slag improved the reactivit of the raw material mixture and the admixtures of barium and manganese contributed to the modification of the alite cr stal which resulted in a clinker with higher strength]

hluwalia S et al presented in their paper the advantages of using low qualit limestone as a raw material for clinker production Limestone with a high magnesium and silicon content and a lower calcium content was subjected to a separation process to concentrate the calcium content in the limestone which would later be used in the production of cement Other methods considered were differential grinding and sieving electrostatic separation photometric sorting and bacterial washing These limestones were considered to be more suitable for wet and semi wet clinker production although it could also be used in other t pes of clinker production processes] Mori T presented a paper dealing with the use of SiO rich fl ash in a Japanese cement plant The fl ash control and treatment plant at the Takehara thermal power plant has been installed and managed in such a

zehrudinosmanovic gmail com

wa that the resulting fl ash is of suitable qualit for clinker production Fl ash replaced the use of cla in the amount of to depending on which of the two t pes of ash was used for the production of clinker]

Bhatt J I et al presented in their paper the possibilit of using mineral tailings produced in the process of copper and nickel production Tailings rich in SiO in combination with other raw materials contributed to the production of clinker which had better strength parameters in cement than commercial cement t pe] Laxmi S et al considered the use of red mud that is produced as a waste in the production of aluminum Sludge containing SiO l O CaO and Fe O added in an amount of completel replaced the iron ore used until then The properties of clinker have not changed significantl The earl strengths in cement were slightl higher while the strengths remained the same after da s] NCB Report as a report on the subject presented the use of carbide sludge as a substitute for limestone in the amount of in the raw material mixture The addition of this material resulted in raw flour that had good baking properties and the produced clinker had ver good characteristics lite and belite cr stals were ver well formed and the specific energ consumption for the firing process was significantl lower]

urohit M et al due to the lack of qualit limestone also presented a paper where the presented the use of a raw material mixture with limestone enriched b the calcium filtration method sing this kind of raw material in a rotar kiln with a two stage c clone heat exchanger clinker production was successfull carried out in a capacit of tons da with the production of clinker of normal strength setting time and other ph sical characteristics The produced clinker had the following composition C S C S C F and C] uertas F M et al demonstrated the use of cr stallized slag in the production of clinker With a high content of CaO SiO and l O the slag replaced significant amounts of limestone sand and cla in the raw material mixture n example of the mineralogical composition of clinker from this test is C S C S C F and C] arada M presented a stud of the use of fl ash as an alternative raw material for cla in the clinker production process

No significant problems were observed in the production process and traces of non combustible residue in the ash did not significantl affect negative changes in the production process] hosh S et al presented work based on the use of ash from rice flakes created as waste in the process of burning the flakes in boilers for energ production sh from rice flakes partiall replaced stone with a high SiO content sandstone in the raw material mixture Considering that the ash of rice flakes also contained non combustible carbon residue the consumption of coal in the process was partl reduced Rice husk ash improved the reactivit of the raw material mixture and improved the qualit of the clinker] Mullick et al presented a stud of the use of fl ash in a cement plant in India The chemical composition of the ash was approximatel the same as that of the cla used until then so the cla was almost completel substituted with fl ash]

ell R J presented in his paper the findings that the control of the degree of saturation silicate modulus and aluminate modulus using fl ash in the raw material mixture is superior to the raw material mixture where shale is used as raw material The test on the basis of which the conclusions were drawn consisted of replacing of shale with fl ash Clinker with ash contained the same amounts of C S and C S but also an increased content of C The increased content of C contributed to a better control of earl strengths and setting time in cement] Everett D presented in his paper the possibilit of using fl ash as a raw material substitute for oil shale In one of the largest cement plants in North merica the shale used as raw material contained up to sulfur resulting in the plant generating large amounts of filter dust C D as a b product that could not be returned to the process Replacing of the shale with fl ash contributed to a reduction in the resulting filter dust

The produced cement was low alkaline and the emission of SO into the atmosphere was significantl reduced] Singh N B et al published a paper where the use of waste material from landfills of coal fired thermal power plants was presented The waste material contained a mixture of fl ash and slag The use of of the aforementioned mixture in the raw material mixture did not jeopardize the production process while the non combustible residue contributed to better energ efficienc The satisfactor qualit of the clinker and the easier grinding of the clinker have confirmed the possibilit of using this material in the production of clinker and cement] In his paper Du Toit presented the results of an industrial trial in a cement plant from South frica where limestone with CaO was replaced with limestone that has a CaO content of about The composition of the raw material mixture was limestone CaO limestone C O slag from boiler plants and magnetite

The produced clinker had similar characteristics as clinker in normal production] oung R D in his patent protected the knowledge about the use of unground blast furnace slag as a raw material component

Replacing the usual raw materials with slag resulted in the production of clinker with an acceptable chemical and mineralogical composition]. Freiman L S with collaborators in his work presented research related to the use of oil shales that have a high calcium content. The research was done in a cement plant in Russia and the composition of the oil shale was from to CaO and from to SiO. The shale contained from to of organic fuel and therefore it was dosed to the pre calciner in the amount of of the raw material mixture. The residual fuel component in the shale contributed to energ savings and the clinker had a satisfactor chemical and mineralogical composition].

Singh N B et al presented the use of rice husk ash in vertical shaft kilns for clinker production. The addition of ash contributed to a better burnabilit of the raw material mixture the production capacit was increased b and the non combustible residue contributed to energ savings. The produced clinker was of adequate qualit]. Bhatt J I et al demonstrated the use of fl ash containing non combustible residue. The ash content in the raw material mixture with limestone and shale in the amount of was limited due to the chemical composition of the ash. During the demonstration the production process ran smoothl and without major changes from the usual state s a result production was achieved with energ savings of and an increase in clinker production capacit of . The produced clinker was of satisfactor qualit but with a lower content of sulphate and alkali. The qualit of the cement produced from the test clinker was comparable to the qualit of commercial cement]. jiwe V I E et al used rice husk ash in the white cement production process. In combination with other raw materials the produced cement did not deviate from the qualit of commercial cement in terms of chemical and ph sical properties].

Bhatt J I with colleagues presented a scientific paper using slag from thermal power plants as a potential raw material in the production of cement. These are materials with a similar composition to fl ash but the particles are much larger. suall slag is added as raw material directl to the raw material mill together with other raw materials in the amount of to depending on the chemical composition of the slag. The produced clinker did not show significant deviations in qualit]. Bhatt J I in his stud investigated the possibilit of using foundr sand as a source of SiO in the raw material mixture. Foundr sand completel replaced ordinar sand and the produced clinker had a higher hardness due to larger quartz cr stals. rindabilit of this clinker was more difficult but the strengths after da s were significantl higher]. iaoquan with associates based on the aspiration for CO neutral cement production b considered the possibilit of reducing CO emissions through the use of alternative raw materials as well as raw materials that had the potential to replace clinker in cement production. In this paper three scenarios in the use of alternative raw materials were considered and . ll testing was done in uangdong China].

owever based on the European Commission s plan to reduce greenhouse gas emissions b b it is clear that man industries including the cement industr must make certain changes in the production process. The transition of production processes to more environmentall friendl ones is gradual but necessar and it is necessar to process all potentials that can contribute to the transition itself. The production of clinker requires a large amount of thermal energ which is on average about kJ kg of clinker].

RI N O

The production of clinker and later cement with natural or alternative raw materials is identical and the same restrictions appl to the production process regardless of whether the raw materials are natural or industrial sources. lternative raw materials in the cement industr are mainl industrial wastes from other industrial plants and the are acceptable for the cement industr for three basic reasons.

- lternative raw material often has a lower cost than natural.
- B using industrial waste as an alternative raw material industrial waste landfills are reduced and
- The use of alternative raw materials preserves reserves of natural raw materials for future generations.

Materials that were created as products of thermal processes in other industries and contain increased amounts of calcium silicon aluminium and iron oxides are ver good raw materials for use in the raw material mixture for the production of clinker. critical point in the use of alternative raw materials created from waste is the compatibilit of the chemical composition in order to partiall or completel replace one of the natural raw materials].

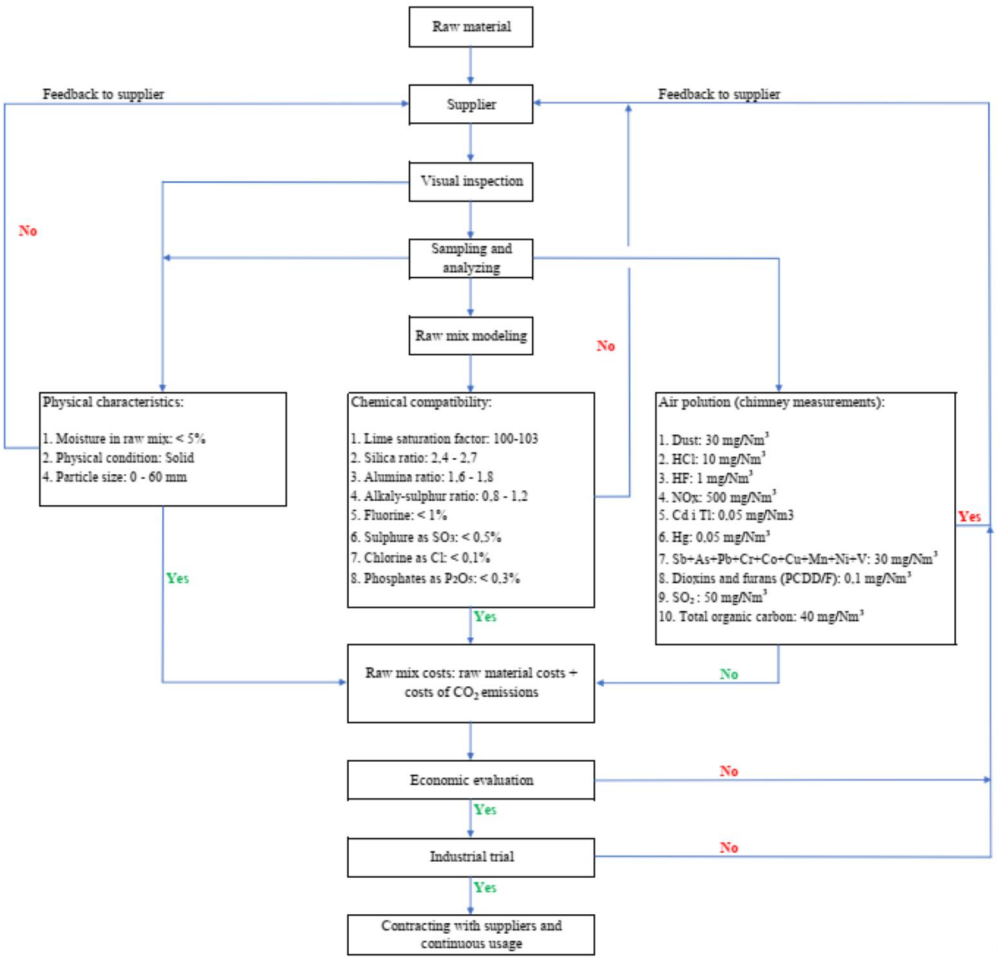
The basic criteria for choosing certain alternative raw materials are

- Chemical and ph sical compatibilit

- vailabilit of alternative raw materials at an economicall justified distance from the cement plant
- The price of the alternative raw material and the economic justification of its use
- The alternative raw material must be ecologicall justified
- The use must not limit the qualit and quantit of the process or product and
- vailable amounts of alternative raw materials must meet the needs of continuous production

lternative raw materials which are available onl occasionall in limited quantities can be used in the cement industr but since it is a continuous production process it is necessar to consider the risks that can be caused b discontinuous changes in the process Taking into account all the limitations in the selection of raw materials it is clear that there are man limitations Some restrictions are exclusive while others are acceptable subject to certain conditions The selection of raw materials according to their ph sical characteristics is a process that is specific to each industrial plant while chemical compatibilit is exclusive and theoreticall the same for most cement plants in the world Environmental compatibilit represents legal restrictions that ma be different depending on the t pe of legal restrictions at the location where the facilit is located When a potential raw material is identified the first step is to establish communication with the owner of the potential raw material determine the steps of the visual inspection agree on the exclusion of samples for anal sis purposes and prepare the financial conditions necessar for the economic evaluation of the justification of use

visual inspection of the potential raw material is important so that the potential user can quickl determine whether the ph sical properties of the raw material are compatible with the process equipment lternative raw materials can ver often be in the ph sical form of sludge fine powder thick viscous mass etc which requires the installation of special equipment for dosing and processing Of course the investment in the installation of new equipment can be justified if it is established as a fact after an economic evaluation fter sampling and anal sis of the potential raw material it is necessar to model the raw material mixture and evaluate the chemical compatibilit Together with the check of chemical compatibilit the check of the compliance of the raw material with the requirements for ecological compliance is also carried out In picture no shows the flow diagram of the selection of potential raw materials for the production of clinker



i re lgorithmic steps of selecting an alternative component in the formation of the raw material mixture

In addition to the basic raw materials for the production of cement limestone marl and sand alternative raw materials such as ash from the thermal power plant slag from the boilers of the thermal power plant slag from blast furnaces waste aerated concrete and waste glass were anal sed

able Chemical composition of alternative ash raw material

Chemical Composition	CaO	SiO	l O	Fe O	Loss on Ignition	Moisture	nit
sh							

Slag is a waste product of coal combustion in a thermal power plant The slag from the boilers is rapidl cooled with water thereb retaining its solid structure It is granular in shape black in colour and resembles slag slag from blast furnaces

able Chemical composition of alternative raw material slag from blast furnaces

Chemical Composition	CaO	SiO	l O	Fe O	Loss on Ignition	Moisture	nit
Slag							

Slag ground granulated blastfurnance slag BFS is a side product in iron production Slag is a water cooled granular material with a large amount of glass phase For man ears blast furnace slag has been recognized in the cement and construction industr as a good material that can be used as an addition to clinker in the cement grinding process It is characterized b high pozzolanic properties and is ideal for the production of cement with a low heat of h dration

able round granulated blastfurnance slag BFS

Chemical Composition	CaO	SiO	l O	Fe O	Loss on Ignition	Moisture	nit
Blastfurnance slag							

erated concrete is a product that belongs to the group of lightweight fine grained concrete Other names for aerated concrete are cellular foam or aerated concrete Lightweight concrete has a lower weight per unit volume than conventional concrete Their volumetric weight is usuall less than kg m luminium powder in the form of fine colloidal dust is most often used to create gas In the case of most mineral raw materials of industrial and natural origin loss b annealing is the thermal decomposition of some carbonate usuall CaCO During the thermal treatment of aerated concrete CO will not be emitted that is this CO has alread been released during the production of CaO which is used as a raw material in the production of this building material

able The chemical composition of the alternative raw material gas concrete

Chemical Composition	CaO	SiO	l O	Fe O	Loss on Ignition	Moisture	nit
as concrete							

iven that the cement industr is still a large consumer of fossil and alternative fuels the appearance of sulphur contained in the fuel usuall causes problems in the process These problems manifest themselves in the form of stickers in rotar kilns Sulphur control is carried out b an adequate ratio of alkali in the raw materials in relation to the sulphur content The alkali sulphate ratio in the raw material mixture should be less than If there is not enough potassium or sodium in the raw materials to bind to the sulphur from the fuel it is necessar to find a raw material or an additive through which alkali can be introduced into the s stem lass is a good source of sodium and silicon essential constituents in clinker

able Chemical composition of alternative raw material waste glass

Chemical Composition	CaO	SiO	l O	Fe O	Na O	Moisture	nit
Waste glass							

R

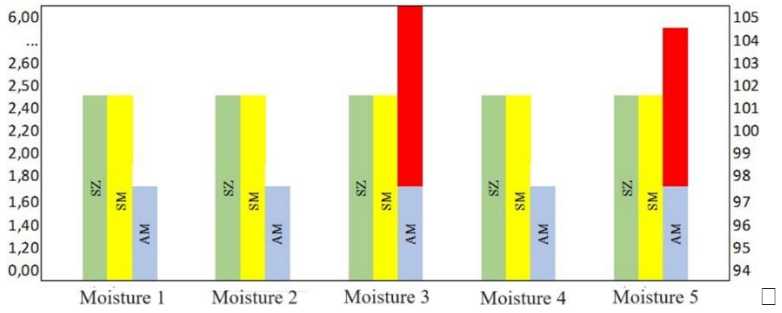
Five mixtures for the production of clinker were anal sed

i Raw material mixture limestone marl and sand
ii Raw material mixture limestone slag produced in the thermal power plant and waste glass

iii Raw material mixture limestone thermal power plant ash and gas concrete
iv Raw material mixture limestone ash created b burning coal and slag from blast furnaces for iron production
v Raw material mixture limestone thermal power plant ash and slag from blast furnaces for iron production

elec io ccordi o he om a ibili of he hemical om o i io of he i re

s the requirement for the degree of saturation silicate modulus and aluminate modulus is limiting the first selection of the potential raw material mixture refers to the exclusion of the raw material mixture that cannot meet the theoretical limitations due to its composition



i re Compatibilit of a particular raw material mixture in relation to degree of saturation and modulus

otential raw material mixtures No and No can be excluded from consideration at this time due to the high values of the aluminate modulus

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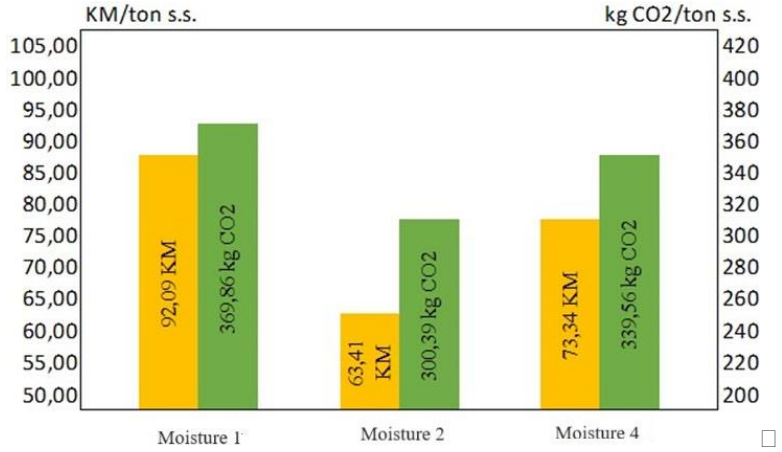
Raw material mixtures No and No do not meet the parameters of the aluminate module so the selection based on the price of the raw material mixture will be considered onl in raw material mixtures and



i re Raw material mixture costs and CO emissions per ton of raw material mixture used

Raw material mixture number represents the optimal choice among all other alternative mixtures that were taken into consideration The use of limestone as a natural raw material and alternative raw materials ash and aerated concrete represents a significant reduction in the use of natural resources with better financial results of the compan and more environmentall responsible production

Based on the processed methodolog in addition to choosing the optimal raw material mixture it is also possible to define a ranking among the raw material mixtures This can give certain cement companies a significant strategic advantage in the event of changes in the market or facilitate long term business planning

ON ION

During the research three prerequisites for the qualit selection and evaluation of the optimal raw material mixture in the cement plant were observed

- The choice of raw materials for the production of clinker is possible onl if there is a functional primar selection methodolog
- It is necessar to develop a compatibilit model of each raw material in the mixture in relation to ecological production and economic criteria and
- The development of software tools significantl shortens the time of finding the optimal solution that is choosing the optimal raw material mixture

The primar selection methodolog ensured the elimination of potential raw materials that could threaten the production process product qualit or have a negative impact on the environment The primar selection of raw materials is characteristic for each plant individuall but the model presented in this paper enables a s stematic approach in the selection process itself regardless of the specifics of individual plants

The development of the raw material compatibilit model in the raw material mixture is based on theoreticall known parameters that guarantee the stabilit of the production process product qualit ecological compliance and economic profit On the basis of the developed model an optimal raw material mixture was reached the use of which can be expected to produce clinker of the required qualit and quantit with a reduction in the average cost of the raw material mixture and lower CO_2 emissions

The mixture of limestone slag from the thermal power plant and waste glass proved to be the best where alternative raw materials in the raw material mixture partiall replaced natural raw materials with In this case the price of raw materials per produced ton is lower b the emission of CO_2 into the atmosphere is lower b The amount of of the used alternative raw material represents a reduction of the emission of industrial waste into the environment b the same amount and the reduction of CO_2 emission provides more space for planning and better financial results considering that CO_2 is an object of international trade

The model presented in this work is flexible to the t pes of raw materials that can be an alternative in the production of cement

Refere ce

R Rohrbach roduction of oil shale cement and recovery of electrical energy from oil shale using the rohrbach lurgi process pp

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In our countr grapes pomegranates rose hips almonds peaches walnuts hazelnuts apricots sour cherries pistachios olives peanuts and tea have an important share among the products widel produced in agriculture and almost all of them are among the top ten in world production The processing of these crops in agricultural and industrial settings results in the release of residues such as kernels hulls slag and stems These residues represent two thirds of renewable energ sources as biomass energ Therefore to obtain energ from biomass it has become important to utilize biomass in energ production b appl ing methods such as chemical biological and thermochemical processes The aim of this stud is to investigate the kinetics of the degradation process of the energ values of the lignocellulosic mixture prepared from grape pomegranate and rosehip seeds as an energ source using a TG TG anal zer To stud the degradation kinetics of the mixture the data obtained from thermogravimetric anal sis at four different heating rates are used to calculate the kinetic and thermod namic parameters with temperature and time dependent weight loss data during degradation The Fl nn Wall Ozawa FWO and Kissinger kahira Sunose K S methods which are widel used to find kinetic parameters such as activation energ reaction order and pre exponential factor from thermogravimetric anal sis data will be used

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IN O ION

The overall energ demand is increasing due to a growing world population coupled with rising living standards Worldwide in response to this demand for energ the reserves of existing traditional fossil fuel sources such as oil and coal are rapidl depleting In addition extracting these resources is challenging due to global environmental problems and price fluctuations Therefore the transition to unconventional or non fossil energ sources such as renewable energ sources looks ver promising and will pla an important role in the energ mix of the future Solar energ wind energ geothermal energ h droelectric energ biomass energ and wave energ are among the renewable energ sources The largest potential renewable energ source for the future is biomass energ as it is widel available after coal and oil eas to store and transport and the application of this technolog is becoming increasingl widespread and accepted ll natural substances of plant or animal origin the main components of which are carboh drate compounds are defined as Biomass Energ Sources The energ produced from these sources is defined as Biomass Energ Biomass sources include agricultural crops wood and wood waste urban waste waste from food processes animal waste aquatic plants and algae Most biomass energ is produced from wood and wood waste municipal solid waste and agricultural waste respectivel gricultural wastes consisting of stalks sunflower corn cotton tomato rapeseed etc husk sheath coffee so bean rice peanut hazelnut walnut etc stalk straw wheat barle r e oat etc and fruit pits are the most important potential source for fuel production as the are rich in sugar oil starch and cellulose Thus both agricultural areas are utilized and plants are used as fuel The methods used in obtaining energ from biomass can be categorized under two main headings biochemical and thermochemical Biochemical methods include biomethanization and fermentation methods biogas and bioethanol are formed as products Thermochemical methods include combustion p rol sis liquefaction and gasification The most widel used of these methods is p rol sis P rol sis is the process of thermal degradation of biomass in an ox gen free environment s a result carbon rich solid products oil liquid products and h drocarbon rich gas are widel used processes To design appropriate s stems for these processes it is necessar to know the p rol sis kinetics of biomass]

In recent ears interest in the thermal degradation of biomass has been increasing The design of suitable s stems for p rol sis processes of plant biomass sources is closel related to p rol sis kinetics Therefore it is important to know how parameters such as heating rate temperature and chemical composition modif biomass degradation] Previousl research has been conducted to investigate the thermal suitabilit of different biomasses for

mkizilca atauni edu tr

bioenergy production including agricultural waste wood biomass and fruit peels] owever each biomass has its own unique properties and composition thus showing the different nature of thermal decomposition Therefore this study aimed to calculate kinetic parameters based on thermogravimetric analysis data obtained under pyrolysis conditions of grape pomegranate and rosehip seeds used as agricultural waste For this purpose activation energy was calculated using the FWO and KAS methods Thus since it is possible to develop design and optimize the pyrolysis processes of grape pomegranate and rosehip seeds the study will enable the evaluation of existing biomass samples with pyrolysis process and will enable the design of the production of renewable environmentally friendly fuel materials in the industrial sector

I N O

Grape pomegranate and rose hip were used as raw materials from a local nkara market The biomasses were pre dried in air and sun for weeks The dried kernels were subjected to crushing and grinding in the mill to a grain size of less than 250 µm then dried in an oven at for hours and analyzed

harac eri a io

Elemental analysis of grape pomegranate and rosehip seeds was performed in the T E MO S IENTIFI brand analyzer model F S N and S amounts were measured simultaneousl

Partial analysis of biomass was performed in a muffle furnace For volatile matter determination g of the grain mixture was placed in a crucible and a muffle furnace at for min The crucibles were cooled and weighed and the volatile content was calculated For ash analysis g of the seed mixture was placed in a crucible and kept in a muffle furnace at for hour The crucibles were cooled and weighed and the ash content was calculated For moisture determination g of the seed mixture was placed in a crucible and kept in an oven at for hours Then crucibles were cooled and weighed and the moisture content was calculated

Thermogravimetric analyses were performed on a NET S ST Jupiter TG T instrument pproximatel mg of the sample was placed in a platinum sample cup and placed in the instrument nal ses were performed at heating rates of and K min and a flow rate of m min in an inert nitrogen gas atmosphere in the temperature range of K Sample mass loss was recorded as a function of temperature and time

Ki e ic

In general the rate of solid decomposition under non isothermal conditions is expressed b the following equation

$$\frac{\quad}{\quad}$$

Where t is time, T is the absolute temperature, f(α) is the temperature independent transformation function and α is the fractional transformation of biomass k is the rate constant and its temperature dependence is given b the rrhenius equation

$$\frac{\quad_0-\quad}{\quad_0-\quad}$$

$$k \cdot \exp(-Ea/RT)$$

Substituting the rate constant expression of Equation into Equation gives Equation as the general expression for the rate of solid decomposition

$$\frac{\quad}{\quad} \quad \frac{A}{\beta} \quad \left(\frac{E_a}{RT} \right.$$

Based on Equation man methods have been developed to determine the kinetic parameters The most widel used of these methods are FWO and KAS The equations of the KAS and FWO methods are given below

$$\left(\frac{\quad}{\quad} \right. \quad \frac{\quad}{\quad}$$

Results and discussion

The partial elemental and calorific results of the raw material blends are shown in Table When Table is examined it contains carbon moisture and ash due to the relatively high carbon and low ash content it can be said that the mixture is a very suitable material for fuel production The main combustible elements of the fuels and were determined to be and respectively Both the and values of typical biomass and the O content of the mixture are very close to the O value of typical biomass The N and S contents were and respectively Therefore fuels derived from blended biomass are advantageous for pollutant gases such as SOx and NOx released during combustion

Table Partial and elemental analysis of biomass products

Partial analysis	**Biomass mixture**
Volatile matter	
Moisture	
Ash	
Fixed carbon	
Elemental analysis	
N	
S	
O	
Thermal value KJ kg	

calculated from the difference

Figure shows the TG DTG curve of the raw material mixture used in the experiments It was found that significant mass loss occurred in the structure due to temperature increase It is known from the literature that hemicellulose cellulose and lignin which are the three main components of biomass thermally degrade at temperature ranges of and K respectively This is due to the separation of the volatile components formed by the thermal degradation of the molecules As seen in Figure there is a significant albeit small separation of volatile components in the K range Above K there is no significant mass loss and almost complete thermal decomposition and separation of volatile components from the structure

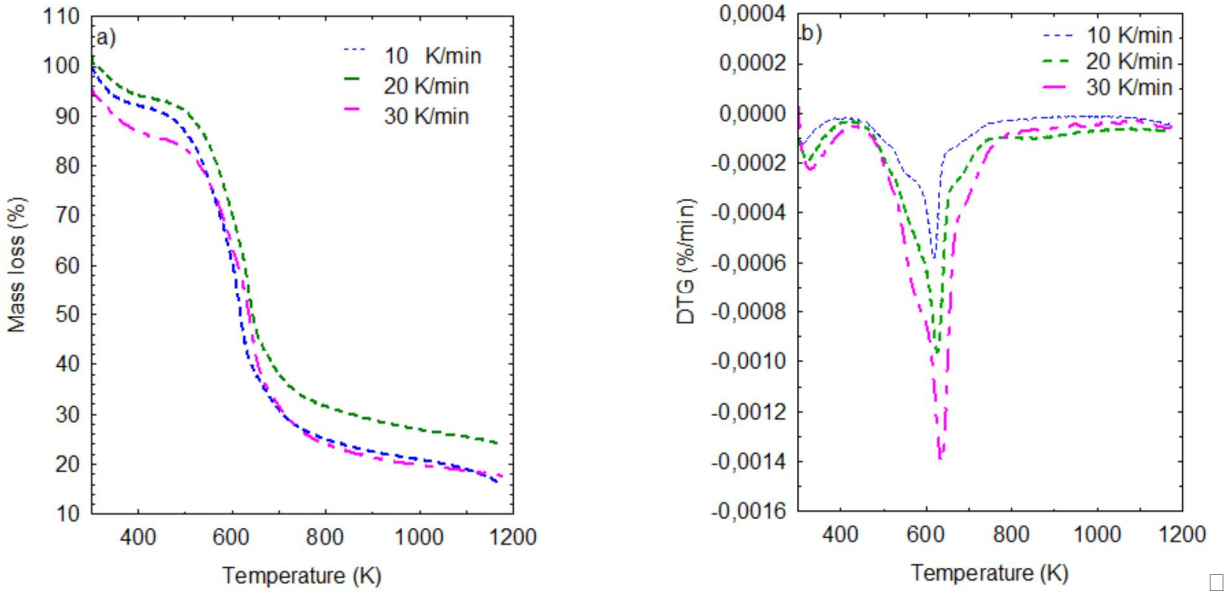
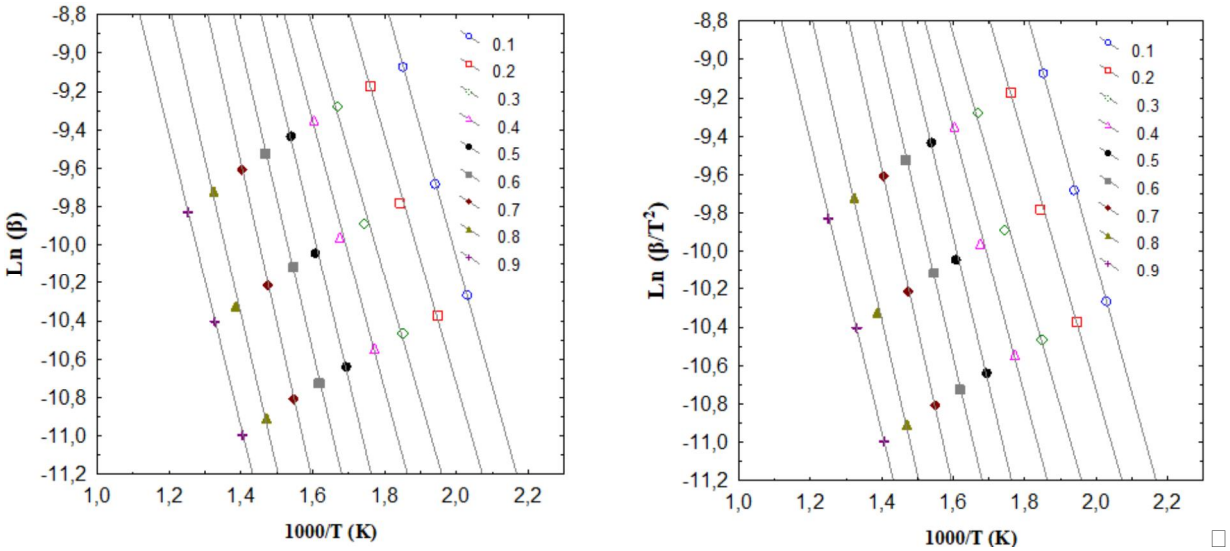


Figure a TG b DTG graph

Kinetic calculations

The FWO and K-S methods were used for kinetic calculations based on data obtained from thermogravimetric analysis of the biomass mixture under non isothermal conditions Plots of ln (β) versus 1000/T for conversion values using the FWO method in equation 5 are shown in figure 2 For the method, the plots of ln (β/T2) versus T for the conversion values using Equation are shown in Figure It can be seen that the lines obtained with the K-S and FWO methods are quite parallel to each other and the values of the activation energies calculated with the conversion fraction are close to each other The activation energies Ea calculated by the FWO and K-S methods are given in Table The differences in the Ea values obtained by the FWO and K-S methods are due to the different approaches to temperature integration This has been observed in studies with a variety of biomass materials such as pistachio shells] walnut shells] cherry stalks] hazelnut shells] corn stalks] and palm kernels]

According to Table the average activation energy for the mixture was found to be kj mol according to the FWO method and kj mol according to the K-S method When these activation energy values are compared with the values found in the literature for other biomass products] it is seen that the are in close agreement



igure FWO and S graphs

able Kinetic parameters

	FWO		K-S	
α	E		E	K-S
		E		E
		E		E
		E		E
		E		E
		E		E
		E		E
		E		E
		E		E
		E		E

ONCLUSION

In this study the pyrolysis of a mixture prepared from grape pomegranate and rosehip seeds was studied by non-isothermal thermogravimetric analysis at temperatures of K and heating rates of and K min The kinetic parameters of the active pyrolysis steps were calculated using the widely used FWO and K-S methods The activation energy values obtained are in agreement with the range of values reported in the literature for hemicellulose cellulose and lignin which are the main organic components of the mixture prepared from grape pomegranate and rosehip seeds The low moisture and ash content and the high volatile matter content make the

biomass mixture a potential candidate for the production of biochemicals The kinetic data obtained from the TG anal sis will be useful for modeling designing and developing thermochemical s stems for hazelnut shells

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Application and Analysis of Experimental and Numerical Studies on the Film Cooling Turbine Blade

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Abstract

Experimental and numerical investigations on transverse jet flow R are conducted using discrete jets on a surface exposed to a wall boundary layer resembling discrete hole cooling systems for turbine blades Coolant flow characteristics at hole exits of film cooled blades are derived from prior analyses with discretized hole pipes and coolant plenum The ENSMA tunnel facility employs a flat plate with staggered rows of holes for experimentation The three dimensional FLUENT code computes mainstream jet velocity fields characteristics on the flat plate Simulation results are presented for both flat and cambered plates focusing on the accuracy of averaged results and film cooling flow physics to assess Reynolds averaged equations predictive accuracy with turbulence models Calculations involve solving governing equations with turbulence modeling considering three dimensional external flow free stream turbulence and stream curvature effects Comparisons between experimental and numerical results for two turbulence models reveal discrepancies near the wall which are identified and discussed

Keywords *Turbine blade heat transfer prediction modeling of pressure gradient Injection to mainstream ratio cooling efficiency*

INTRODUCTION

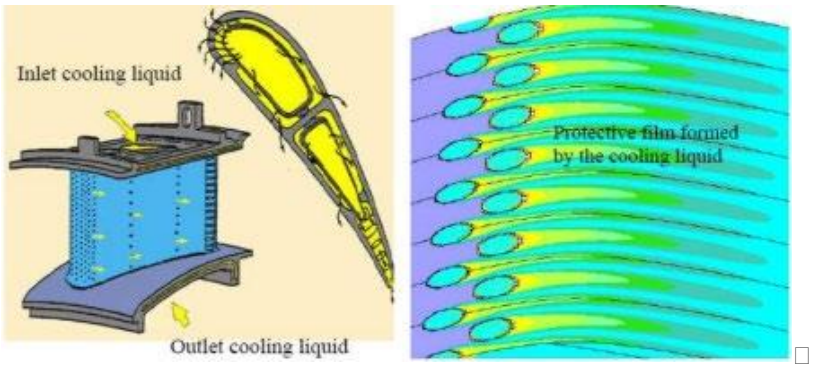
Turbine blade heat transfer prediction is crucial for efficient blade cooling schemes but turbulence modeling is often the main cause of disagreement with experimental data This is due to complex flow phenomena in turbine passage and the interaction of injection with aerodynamic curved surface flow around blades Factors such as stagnation flow heat transfer steep pressure gradients free stream turbulence high Mach number blowing rate ratio and three dimensional effects are presented Understanding coolant film behavior and its interaction with mainstream flow is essential Interest in this field has grown but many studies have focused on simple geometries

PROBLEM DEFINITION

With increases in turbine inlet temperature gas turbine designers are looking to improve cooling effectiveness without raising the amount of coolant usage Typically film cooling is used to protect the blade outer surface by injecting cooler air through holes or slots on the blade surface Film cooling is commonly employed to provide effective blade protection and is realized by injecting coolant jets into the crossflow of hot gases from film cooling holes or slots on the blade surface The injected coolant is bent over by the cross flow and forms a film over the blade surface see Fig and protects the surface from the hot crossflow gases

The complex flow field produced by the interaction of the jet and the crossflow has been extensively studied and reported in the literature Experimental studies of] have revealed that the near field of the jet is highly complex three dimensional and characterized by large scale coherent structures in the form of jet shear layer vortices which dominate the initial portion of the jet the horseshoe vortex wrapping around the base of the jet the counter rotating vortex pair which results from the impulse of the cross flow on the jet and dominate the turbulence structure in formed mixing layer So strong distortions in the jet section result from the counter rotating vortex effects and the wake vortices formed in the jet wake The overview of the complex flow field produced by the interaction of the jet and crossflow is shown in Fig

pplication and anal sis of experimental and numerical studies to the film cooling turbine blade



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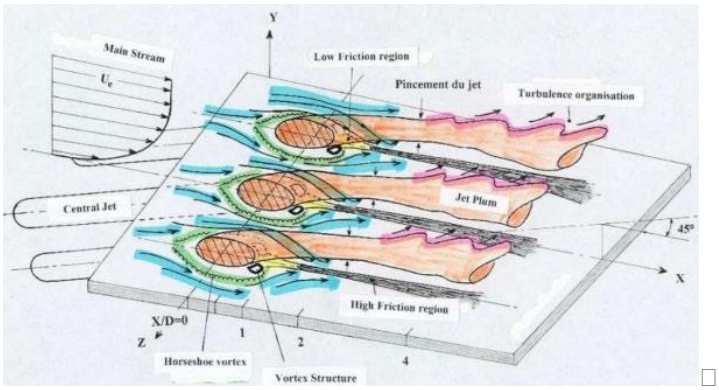


igure Flow diagram of a row of jets based on experimental results

PR IOUS R S R O ILM OOLIN

R NS S udies

The majorit of the reported film cooling simulation studies are based on the time averaged R NS equations few representative studies and papers performed several computational studies using turbulence modeling with a commerciall available flow solver Fluent are presented carried out an investigation using a high Re nolds RST model emplo ing wall functions to avoid solving the Re nolds stresses all the wa to the wall

The effects of the inclination of the holes on the film cooling heat transfer coefficient have been studied b n additional stud conducted b defers the effect of the angle on the adiabatic efficienc examined the orientation of the inclination of the hole and its influence on film cooling The claimed that the injection ports laterall inclined produce cooling holes better than facing forward

Not onl the shape but also the inclination of the holes can alter the performance of film cooling measured the adiabatic efficienc through liquid cr stal thermograph The studied the influence of the injection ratio and orientation downstream of the inclination angle on efficienc Three angles and were tested The angle of gave the best cooling characteristics in their paper presented detailed measurements of the film cooling effectiveness for three single scaled up film cooling hole geometries The hole geometries investigated include a c lindrical hole and two holes with a diffuser shaped exit portion s compared to the c lindrical hole both expanded holes show significantl improved thermal protection of the surface downstream of the ejection location particularl at high M blowing ratios The predictions of several Re nolds veraged Navier Stokes solutions for a baseline film cooling geometr are anal zed and compared with experimental data

L S S udies

There have been several studies that have utilized LES for film cooling performed a Large Edd Simulation LES of a high blowing ratio M film cooling flow with a densit ratio of unit Mean results are compared with experimental data to show the degree of fidelit achieved in the simulation The experimental flow field and heat transfer measurements are available for the flat plate at man axial locations for fixed inlet Mach number Re nolds number inlet turbulence intensit as well as the inlet boundar la er thickness far the most popular

turbulence models utilized toda□ for flow and heat transfer calculations are the high and low Re□nolds number two equation edd□ viscosit□ models□ The k□e k□ω are the most used models. These models often offer a good balance between complexit□ and accurac□□ The abilit□ to predict transition to turbulence which is often present on turbine blades and the abilit□ to integrate into the walls are other reasons for their wide use□□

In this paper□ both numerical turbulent simulations and experimental measurements have been performed□ This stud□ focuses on the efficient computation of film cooling flows□ The main objective is to establish how reliabl□ film cooling flows can be predicted using commercial software□□

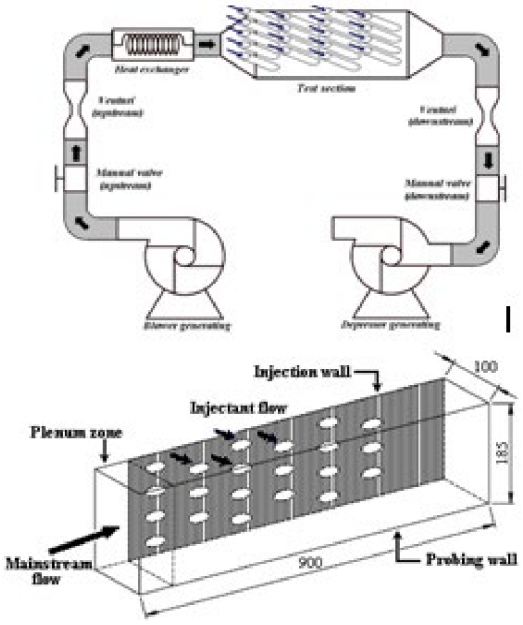
Two numerical calculations are conducted in this work□ The first one is compared with the experiment□ measurements that is carried out on several staggered rows of jet in a crossflow problems□ The second one is onl□ numerical calculation□ Simulation results are presented for both flat plate and cambered plate represented b□ three□ cambered N□□□ profiles□□□ two equation turbulence model (the realizable k□ε model) and a two la□er zonal near□ wall treatment method□ the enhanced wall treatment in FLUENT□ have been used to show if it is necessar□ that□ the Re□nolds averaged equations R□NS with turbulence models need anisotrop□ and realizabilit□ corrections to□ provide correct predictions for the cooling effectiveness□ or two equation turbulence model provide the needed□ quantitative accurac□ and the rich flow ph□sics representing such flows□□

□ll simulations emplo□ed the k□e turbulence model with non equilibrium wall functions□ While the standard k□ε□ model is a high Re□nolds number model its theor□ does not provide an anal□ticall□ derived differential formula□ for effective viscosit□ that accounts for□ For this reason□ we combine the k□e and k□ω models in a way that would□ allow them to be used in the low Re□nolds number effects regions□ In other words□ the method uses the k□e model□ near the wall□ but switches through a function□F□ to the k□ω equations away from the wall, these equations having□ been transformed to a k□ω format.□

Note that effective use of this feature does depend on an appropriate treatment of the near wall region□□

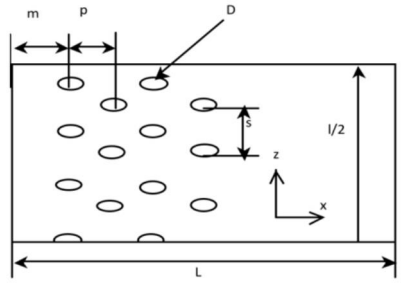
□ MO□□L□□N□□□P□RIM□NT□L□□T□ILS□

□lthough experimental tests of a primar□ air flow pass b□ a secondar□ flow on a flat wall perforated was performed□□ The basic aim of these proposed geometries is to allow more uniform spreading of the jet along the surface resulting□ in uniform higher cooling□ The experimental measurements have been conducted on the IS□E ENSM□ tunnel□ facilit□ using a flat plate with several staggered rows of holes at the □□ institute in □oitiers France□□ Fig□□□ shows□ the IS□E ENSM□ tunnel facilit□ and the positions of several staggered rows of □□□c□lindrical cooling holes□ inclined at□□□□ from the wall with a □mm diameter of each one with elliptical edge ends whose value of the major□ diameter is equal to□□□mm□□



□igure □□□□ eneral description of the tunnel facilit□ and the flat plate□

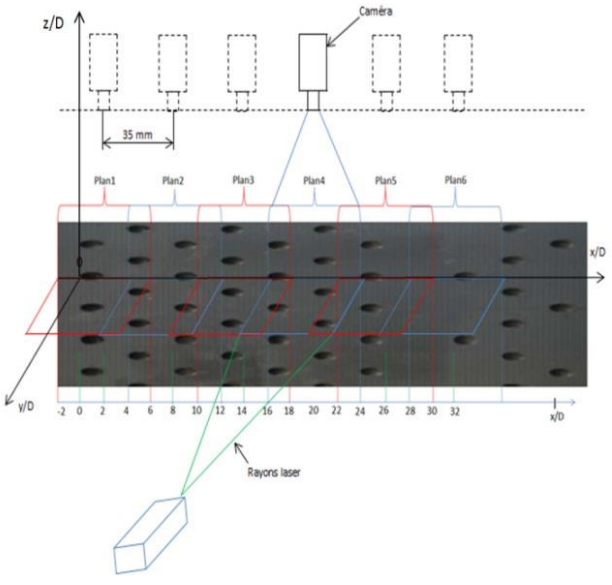
Fig□□□ shows the geometrical distribution of the holes□□



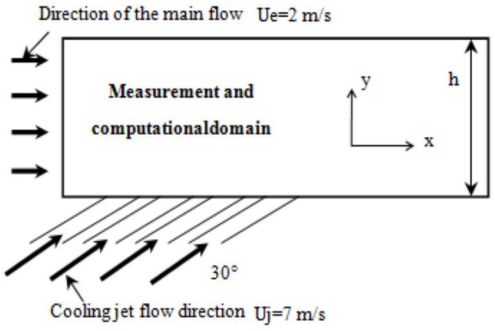
□igure □□ Upper view of the flat plate□

The temperatures of the two flows are □□□□□ for the cooling air and □□□□□ for the hot air The purpose of this stud□ is to show us how is formed the cooling film generated b□ the cold airflow used in cooling turbine blades □□ oth□ mean and fluctuation velocit□ field measurements are realized using □□ I□□ s□stem □□ double pulsed Nd□ag L□SER □□ uantel□ig Sk□□ is used to set up the light sheet of the □□ I□□ setup The exit energ□ is nearl□ □□□□ mJ for each L□SER pulse The wavelength is □□□□ nm The laser beams are focused onto a sheet b□ one c□lindrical f□□ □□□□ m and one spherical f□□□□ m lens The time dela□ between two pulses which depends on the velocit□ and the size of the observation fields varies from □□ to □□□ ms The video images are recorded with a □i Sense Dantec□ camera The frame grabber using a pixel clock digitizes the analogue video signal to an accurac□ of □□ bits In the frame grabber each field is digitized in □□□□□□□□□ pixels with gre□ levels The acquisition frequenc□ is □□□□ z□□ Interrogation of the recorded images is performed b□ two dimensional digital cross correlation anal□sis using □ Flow Manager□□ The final window has a size of □□ b□ □□□ pixels □□□□□ b□ □□□□□ mm and there is a □□□□ overlap□□ The flows are seeded with smoke generator□□ previous stud□ of the drop size distribution has shown that the mean □ diameter is equal to □□□□ m For each velocit□ field □□□□□□□ I□□ images have been recorded We used these □□□□□ velocit□ fields to calculate the different parameters such as mean velocit□ and velocit□ variance fields The □ computation of the convergence of the first two moments of the velocit□ shows that □□□□ velocit□ fields are sufficient□□ ur experience of the I□ was made on a testing flat plate crossed b□ four open rows of coolant jets □ Ra□□□□□ inclined b□□□□ degrees relative to the horizontal direction which is the transverse flow direction The □ two main flows and injection are located in the same plane x □□□ To do our experiments we divided our plate into □ □shooting plans The camera can move in the plane x z along the z axis with a displacement of □□ mm between □ each plane□□

Fig□□ illustrates the six measure planes on the test facilit□ The experiment results obtained will be used to validate □ the numerical results obtained b□ R□NS simulation conducted in the same conditions and using k ε and Shear □ Stress Transport □SST □turbulence models in order to choose which one of the two models will give the best □ agreement with the experiments So the chosen model will be used to investigate and estimate the curvature effect □ on the coolant jets crossflow interaction The main flow is the movement in the x direction with a linear velocit□□ equal to □□ m s against the direction of flow of the injection air is in a direction inclined at an angle of □□□□ relative □ to the x axis in the plane x z□□□



□igure □□□ Measurement plans available with I□□



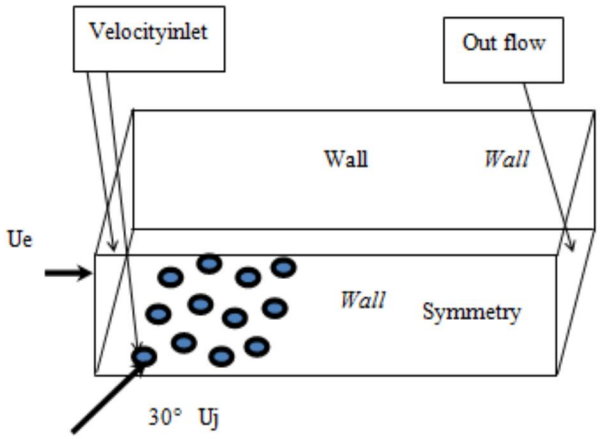
igure alculation domain and experimental setup

N OMPUT TION L OM IN N OUN R ON ITIONS

ompu a io al e ails for he I compressible lo omparis o i h he perime s

In this part we aim to compare the incompressible D stud flow numerical results with the experiments under the influence of the two turbulence model Fig shows the numerical D flow domain one s mmetrical half which is the same at the IS E ENSM test facilit Four staggered rows of c lindrical cooling holes D mm s D were located on the flat plate The hole spacing ratio in the transverse direction s D is and in the axial direction p D is

The commercial finite volume code FLUENT was used in this investigation and the boundar conditions taken for the compute are shown in Fig The second order upwind scheme has been used for the discretization



igure Experimental and numerical studies D domain and boundar conditions

The dimensions of the experimental stud real and numerical are given in Tab

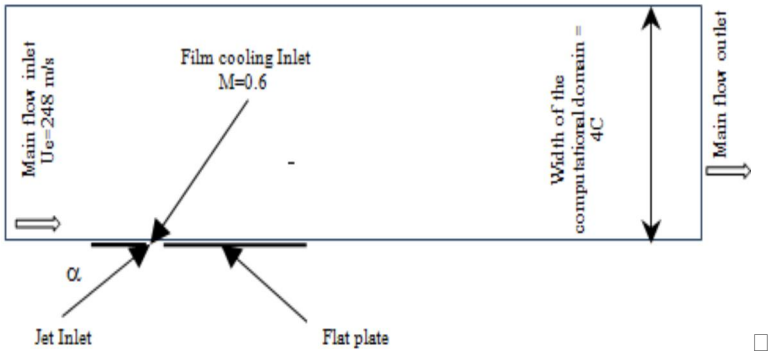
Table rid spacing computation for a given

	Incompressible Flow	ompressible Flow
Ue m s		
L m		
Re		
w m		

ompu a io al omai for Numerical ompressible S ud

To be in such conditions of cooling of gas turbine blades we considered a single row of holes film cooling Simulation calculations are conducted for both flat and cambered plates represented b the three cambered N profiles N and with the ke emphasis here on the accurac of the curvature effects on the film cooling flow ph sics and the turbulence models

The single row of jets in interaction with the compressible crossflow is investigated The jet to cross stream blowing ratio M is and the Mach number is taken to correspond to incompressible flow omponents of mean velocities are compared with experimental results data at upstream and downstream locations in the x plane injection the s mmetrical center plane The velocit is dimensionless with the cross stream velocit The modeled transport equations were solved using a two dimensional FD FLUENT code non uniform staggered grid and mesh cells including the jet injection region are set up in the computational domain shown in Fig a The topolog of the t pe grid used in this stud is described b the rectangular west external boundar which is corresponding to the inlet and outlet regions the east boundar is corresponding to the N surface and the south and north internal grid lines forming the connection region to close the topolog The inlet region part of the west boundar and the exit region also part of the west boundar were placed respectivel far upstream and downstream of the leading and trailing edge of the profile



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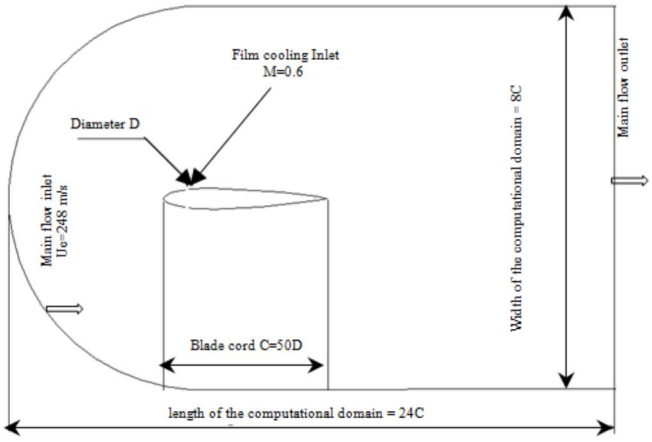


b

igure a Two dimensional computational flat plate domain and b two dimensional computational Naca profoil domain

ou dar co di io s

The elliptical partial differential equations nature requires boundar conditions at all boundaries It was therefore considered especiall in the present work three t pes of boundar conditions as shown in the figure below see Fig These three t pes are

The entrance of the jet
The flow awa from the blade
The rigid walls of the blade

is the jet penetration angle
D is the slot width m
is the blade cord m

The same domain was used to simulate the three N and fluid flow profiles Whereas in the case of the flat plate onl the upper face is used The boundar conditions considered are those of a compressible turbulent flow These conditions are defined as follows

□

□The flow of the main entrance and the far walls □□ressure far field□
□Entr□ of the jet □Mass flow inlet□
□Wall of the blade and the flat plate □Wall□

□

□ne major step in simulating fluid flows with a turbulence model is the choice of appropriate inlet values of the solved primar□ variables u□ v□ k□ or□ □ for the flow entering the computational domain□The boundar□ conditions are derived from the experimental measurements □□n the jet exit surface the axial and the vertical velocit□ components are defined while the lateral velocit□ is neglected□In the upstream boundar□ the axial velocit□ profile□□ profiles are also specified□The axial velocit□ component is given in the external flow while the kinetic turbulent energ□ and the dissipation rate are calculated□The upstream and downstream conditions have zero gradients for all the state variables□□

□

□□□ Meshi□g process for □□o calcula□io□s□□

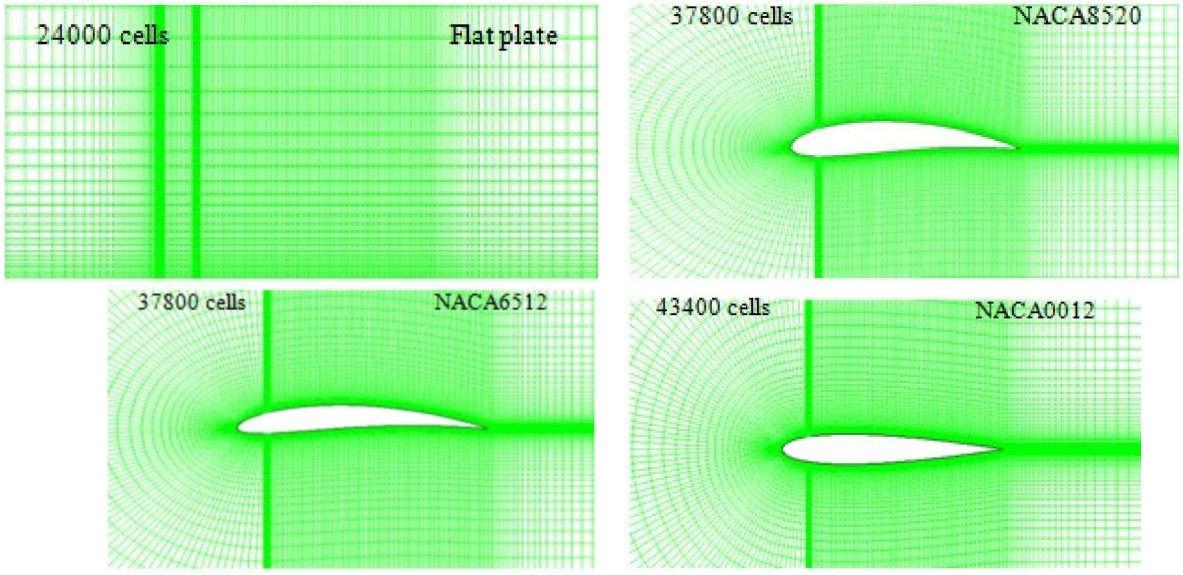
□

To choose a suitable mesh for the flat plate and for the N□□□ profiles in the case of the two conducted calculations□□ we realized two different meshes□the first one used for the half flat plate which consists of□□□□□ meshes and the second one consists of tighter at the level of the wall with a□□□ times thinner step□The formulas used for estimating□ □□ are given b□ the Schlichting skin friction relationship□For a turbulent boundar□ la□er on a smooth flat plate□□ the correlation is valid for Re□□□□□□□The densit□ and viscosit□ given b□ default in the form are for air at sea level□ and room temperature□□□□□ □□□pplied to the incompressible and compressible studied flow it is so able to estimate□□□ for the corresponding grids□Results are presented in the following table□□□To include points in the sub□viscous la□er□wall treatment□□both numerical calculations□meshing have two different nodal grids in an amount of□□□□□□□□cells□in the half field□corresponding to the three dimensional incompressible flow□This represents over□□□□ of the total number of meshes in the half domain considered near the wall□Table□□shows the grid characteristics in this region□□

□

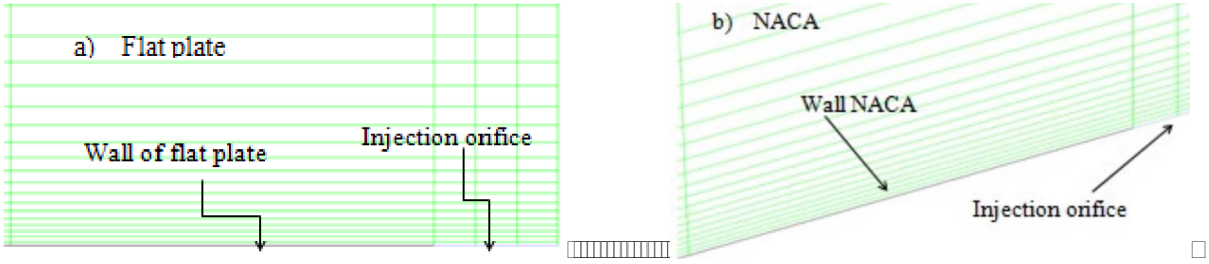
It□was□noted□that□the□results□obtained□from□these□two□meshes□are□almost□identical□□Therefore□□to□minimize□ computational time a less refined mesh was performed close to the wall as well as the case of the flat plate for the different N□□□□ profiles□The different meshes are shown in the following figures□□

□



□igure □□□□ iews of the computational domain used□□

□



□igure □□□□oom of the mesh close of injection orifice a□flat plate and b□N□□□□ profile□□

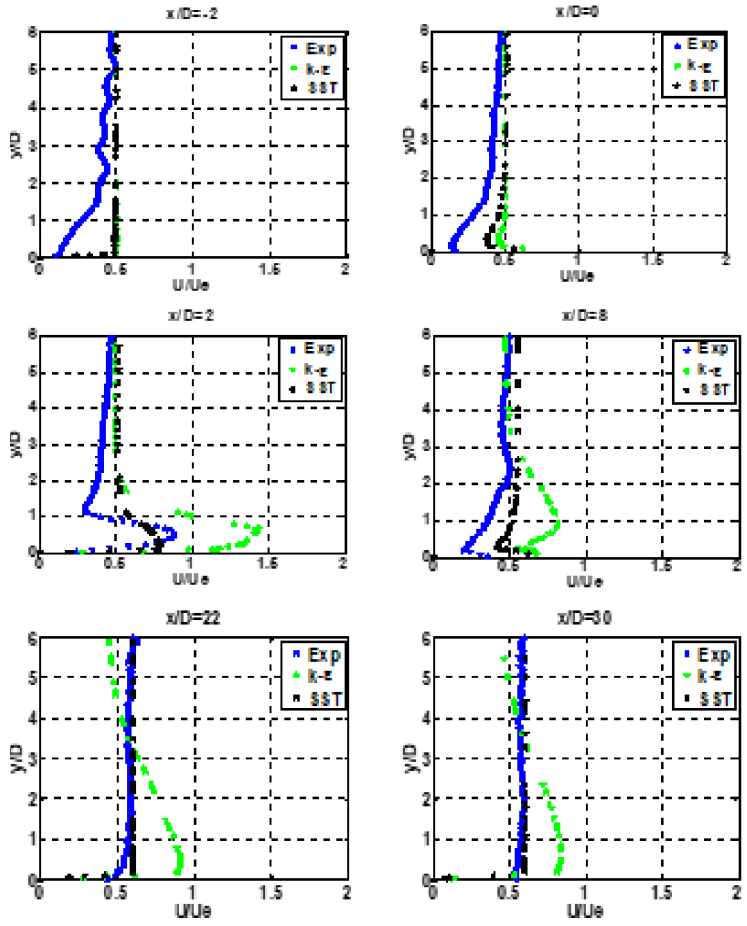
R SULTS N IS USSIONS

In this section we will present representative results from experiments and R NS studies focusing on determining each method s predictive capabilities The discussion of the results consists of a comparison of numerical and experimental data to show the qualit of the computational method Then the exit jets area and the spreading are anal zed and the mixing process is investigated The R NS simulation method of the present stud is validated b comparing the time averaged flow field with the particle image velocimetr I measurements of the present work To obtain the mean and the time averaged quantities the flow field has been sampled over combined streams wise and spanwise planes ere one of the combined planes corresponds to one measure So six measures have been conducted for the crossflow fluid that needs to pass over the complete measurement domain that contains the six rows of jets

Three ime sio al I compressible lo alcula io

omparis on e ee he perime a d he alcula io Resul s o la Pla e

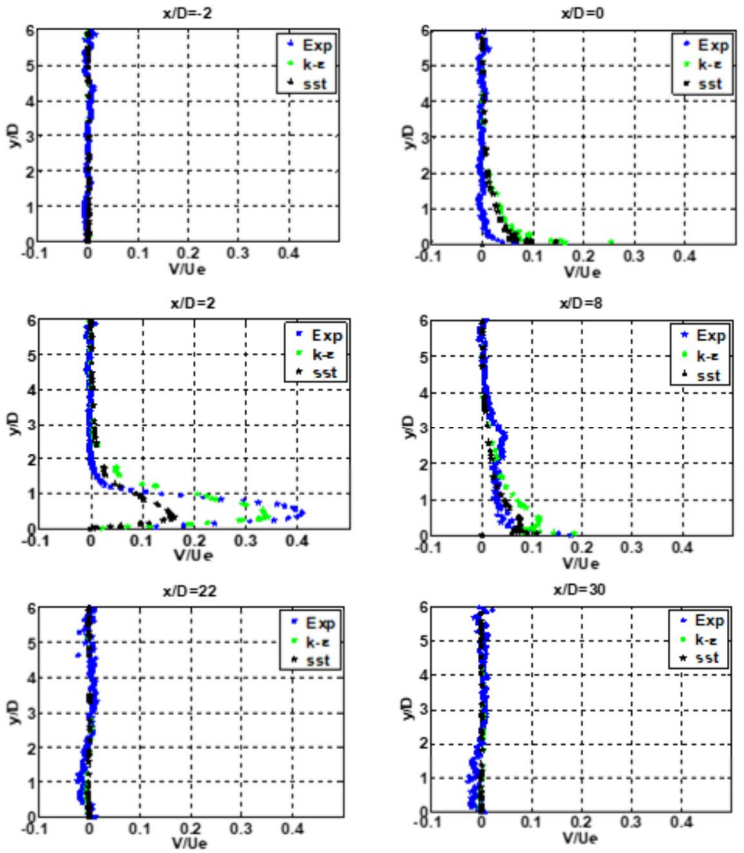
To visualize the flow behavior of the jet cross flow interaction mean and turbulent quantities are plotted at the x z center plane in Figs and in comparison between the measured and the calculated quantities The main objective of this stud part is to determine which model is best to provide the behavior of the flow interaction since the jets exit into crossflow until far downstream



igure omparison between measured and calculated reduced average velocities U Ue along the center plane D

Figs and show the comparison between the I experiment and the three dimensional calculation results on a flat plate obtained for the two turbulence models used the k e and the SST on a flat plate for which the blowing rates are the same The axial U Ue and vertical Ue average reduced velocities profiles are presented at the spanwise s mmetr plane D at different streamwise locations D x D x D x D x D and x D and discussed The anal sis of these profiles shows that in the neighbourhoods of the injection exit area the external flow is disrupted clearl b the effect of the jet t the film flow rate value of M the

flow is exiting the holes near the exit section i.e □□ D □□□□□ The figure shows ver□ marked differences between the results of both models compared with experience just behind the jets and over the wall The k□□ model seems to overestimate the wake regions jet flows than experience shows compared with the SST model Further downstream the jets appear to be largel□ unaffected The pressure side jets of the injection row are more directed and ma□ leave onl□ low effectiveness coolant traces along the end wall surface indicating that a high momentum flux is inducing jet lift off This behavior is related to the calculations and measurements but more pronounced with the k□□ model than with SST model□□



□igure □□□□ omparison between measured and calculated reduced average velocities □□ Ue along the center plane □ □D □□□

□

□□□□ **Reduced Mea□□eloci ies U Ue ompariso□□e□ee□□he T□o k ε a□d SST Turbule□ce Models□**

□

To visualize the laterall□ spreading □□□D direction□ behavior of the jets cross flow interaction reduced mean velocities so contours of the three dimensional incompressible calculation are plotted at three streamwise positions x D □□□ and □□□ positions and along the spanwise plane □□D and shown in Fig□□□ Results are presented and discussed about iso velocit□ lines Iso velocit□ lines provide information about the laterall□ spreading film It is clear that the two models are quite similar in their prediction of the shapes and velocit□ contour intensities It ma□□ be noted for example that at □□D □□□ the magnitude of U Ue values of □□□□ to □□□□ for the SST model and □□□□ to □□□□ for the k□□ model□□

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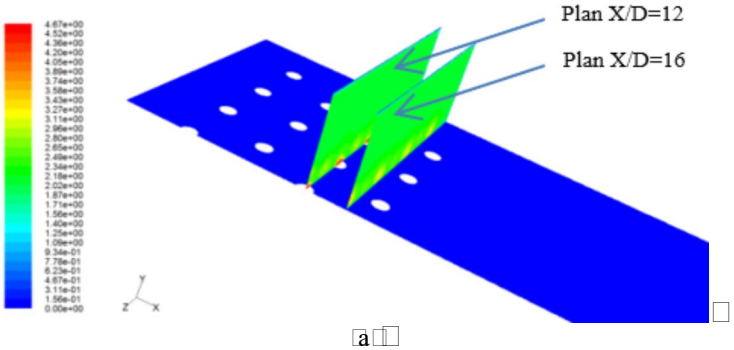

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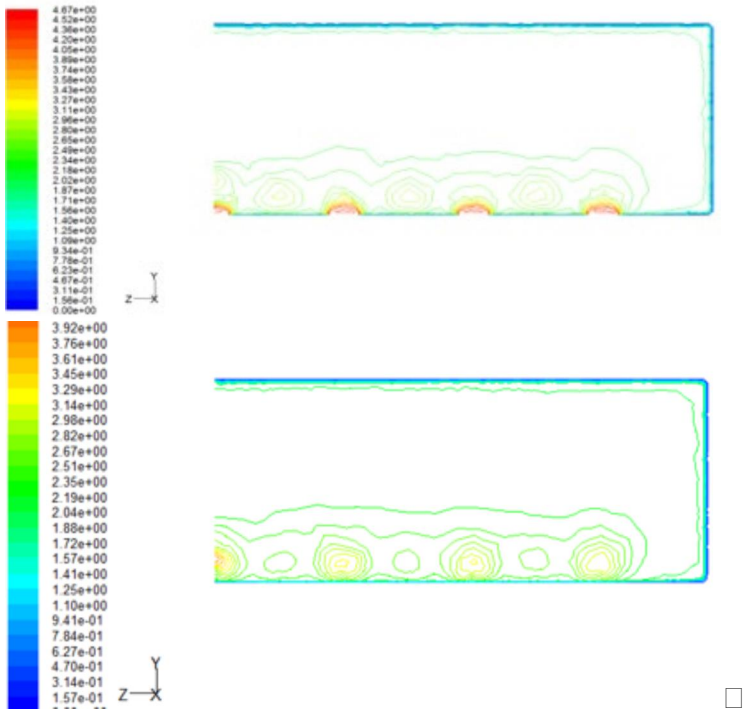

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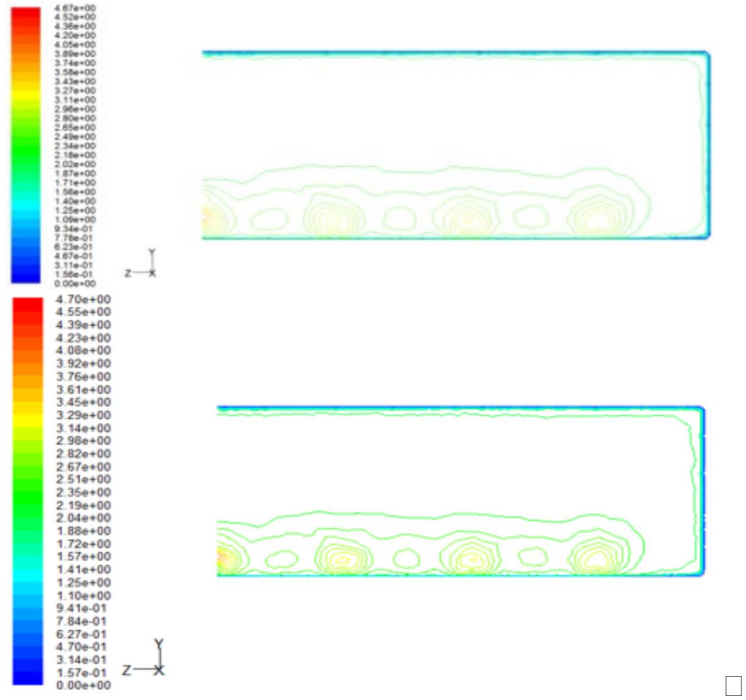

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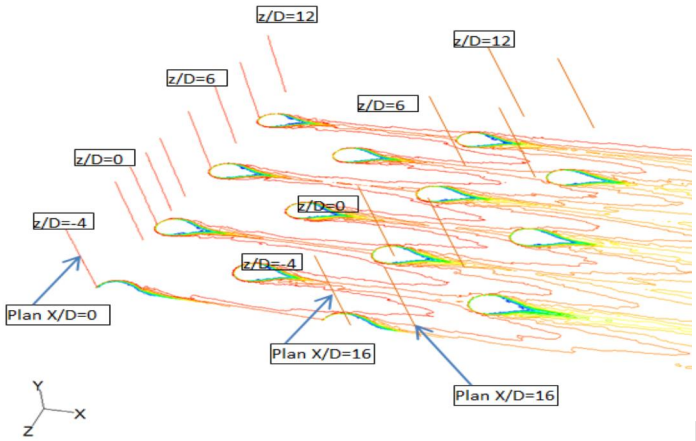
□igure □□□□□ontours □f □elocit□ magnitude for k□e and SST models □□a□ □□enter planes □□ □D □□□□ and □□ □D □□□□□□b□□ contours of velocities magnitude for k□e and SST models in □□ □D □□□□center plane and □c□□contours of velocities□ magnitude for k□e and SST models in □□ □D □□□□center plane□

To visualize the jet exit into the transverse flow□Fig□□□□shows the three axial locations □□ □D □□□□□□□□and □□□□The□ results relate to the profiles of the average longitudinal velocit□ profiles at different spanwise locations □□ □D □□□□□□□□ □and □□□are shown in Fig□□□□□ere again□the two models are quite similar in their prediction of the jets exit into□ the main flow□□



□**igure** □□□Different□spanwise□plane□locations□□D□□□□□□□□□□□□and□□□at□different□stream□wise□positions□x□D□□□□□□□□□□ and□□□□□

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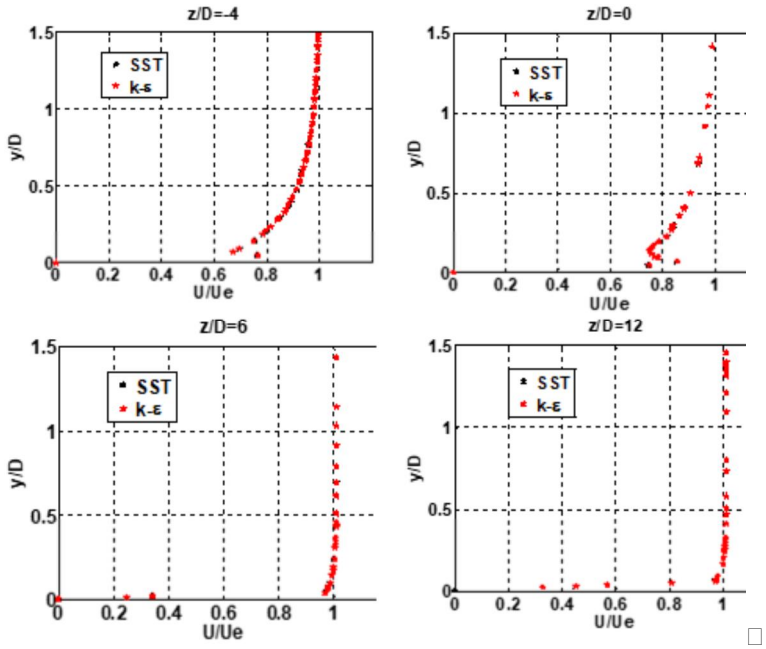

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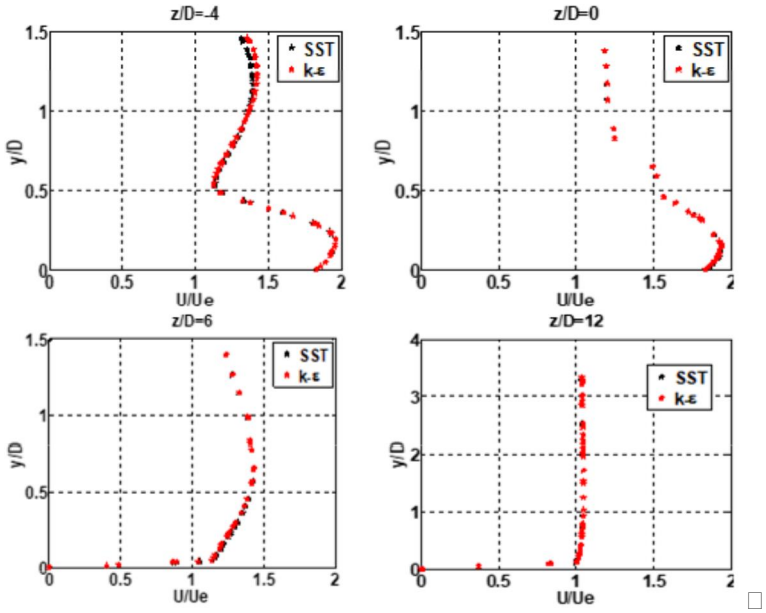

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□pplication□and□anal□sis□of□experimental□and□numerical□studies□to□the□film□cooling□□□

Fig shows the streamwise visualizations of turbulent kinetic energ obtained with the two turbulence models Figs a and b in comparison with I measurements Fig c for the case of a center plane jet injection into the boundar la er of an air stream at velocit ratio M The behavior of the boundar la er flow coolant jets interaction is provided b downstream along the spanwise s mmetr plane The visualizations show the full developed turbulent jet exit shape into the boundar la er and we observe the cross flow streamlines lifting provided b the jet In the case of the two turbulent models the predicted kinetic energ of turbulence of the flow field is inacceptable agreement with the I measurements

The evolution of the turbulence kinetic energ k is shown in Figures a and b and measured in the stream wise s mmetrical plane D The jets exit is well reproduced and their trajector section is visible up to a vertical distance D from the wall The experimental result shows the well development of the jet s path in interaction with the cross flow lthough two distinct regions are observed the potential cone where the kinetic energ of turbulence is ver low approximatel m s and the section from the beginning of the path curvature of the jets under the influence of shear flow transverse forces where the kinetic energ of turbulence increases m s to m s at D The numerical result is reproduced relativel well especiall over the wall until D owever the comparison with the experimental leaves shows a gap between the kinetic energies values m s for numerical calculation against m s for measurements This is seen as ver satisfactor

The development of the separation and the vortices was alread observed in Fig showing the upper and lower edge sections within the turbulence level region at the different instantaneous time levels between predicted and measurements The vortices which originate from the span wise edges of the jet whole cause Dizene the counter rotating eddies governing the penetration and mixing between the cooling fluid and cross flow

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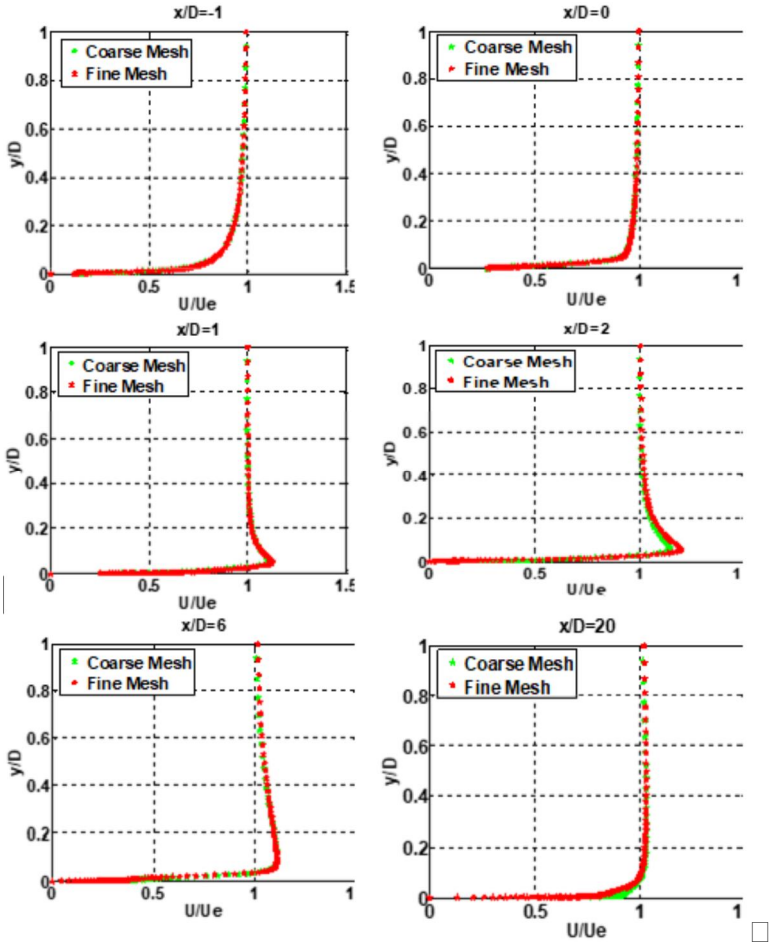
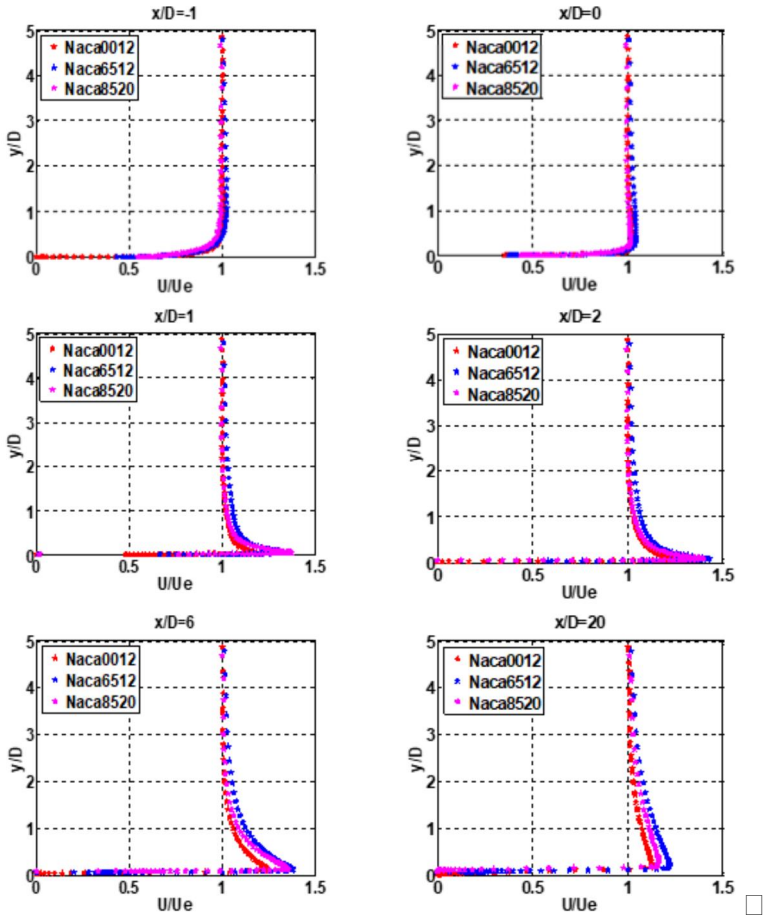


igure omparison between axial reduced velocities U Ue obtained b the turbulence model k with fine mesh and coarse mesh

Figure shows the appearance of the reduced axial mean velocit profiles U Ue obtained b the turbulence model k ε for two different meshes coarse and fine This stud was conducted to see the effect of the mesh on the obtained results to select a suitable mesh which gives good results with the minimum possible number of nodes to gain in U time calculation We note that in all calculation stations chosen the appearance of the reduced velocities is the same except farawa downstream x D where small differences are visible and which are probabl due to the calculation accurac So we preferred to use a large mesh cells for a half flat plate and cells for the s mmetrical profile while cells are used for the cambered profiles

e ailed eloci Profiles is ribu io ompariso e ee Se eral N Profiles ffec of Surface ur a ure

Three N profiles are used to perform with the SST turbulence model the effect of surface curvature The focus of this investigation is to investigate some cambered geometries on the behavior of film cooling and surface curvature effects in comparison with the s mmetric profile The N profile was chosen to evaluate the curvature effects in comparison with the experiment results obtained on a flat plate The aim is mainl to explore which one of the two models used is better perfectl reflects the ph sical phenomena of jet cross flow interaction Therefore the flow around the s mmetrical profile N is calculated and the results are presented and discussed for two turbulence models which are the k ε, and the T models. lso, two am ered profiles N and N of high camber line see Figure are tested to evaluate the effect of the strong surface curvature effect The comparison of the calculated characteristics results of the jet cross flow interaction is carried out b the SST turbulence model for the three N profiles Results of the average velocities are presented on Fig and discussed for a single row of coolant jets M inclined b degrees relative to the horizontal direction which is the transverse flow direction



igure omparison between predicted axial mean velocities profiles in x plane with SST model for N N and N

Figure shows the surface curvature effects on the mean axial velocit component in the streamwise center plane at axial positions of x D x D x D x D x D and x D obtained b the SST model for

N profile The profiles appear similar in their shape but significant differences appear because of the curvature effect

The N and N profiles present high over velocit upper the wall than the N The stream wise velocit is over predicted b all models The profile thickness affects directl the radius of curvature and the curvature When the profile is thicker the curvature is low and when the profile is thin the curvature is strong The differences shown of the results are explained b this behavior The SST model seems to give better results than the k epsilon model in comparison with the results from the literature

ONLUSION

R NS with two turbulence models is applied to simulate the penetration and the development of a cooling jet into a crossflow turbulent boundar la er The flow ph sics is discussed b identif ing the development of the mixture mechanisms between the jets of different rows The over prediction of the mean axial velocit in comparison with experiments ma be explained b the abilit of k and SST models to capture the energ production and transport associated with the coherent scales The time averaged R NS predictions represented b the turbulent kinetic energ are not in excellent agreement with experimental data measured in this work The flow ph sics is also discussed with the results of the vortical structure observed in the streamwise s mmetric plane The simulations of different velocities show volume effects to dominate the flow field near and in the vicinit of the jet hole detailed anal sis of the curvature effect proves the significance of the surface curvature in the d namic flow field of the mixing process The higher irregularit pattern of velocit profiles close to the wall ma be attributed to the curvature effect rather than the predicted capabilit of each model n significant improvements are observed with the k e predictions in comparison with the SST model The anisotrop in the flow turbulence and the effects of the surface curvature are not the major contributors to the lack of agreement and the discrepanc ma be provided b the inabilit of the R NS method to make a difference between large and low scales or the large scale unsteadiness

ck o ledgme s

I want to express m thanks to Mrs Eva Dorignac and Mr ildas Lalizel of IS E ENSM School Universit of oitiers in France for their acceptance to provide me all possibilities in the institute for the use of equipment and experimental techniques to perform m experiments

Refere ces

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N Ince and M Leschziner omparison of three dimensional jets in cross flow with and without Impingement using Re nolds stress transport closure in *D po i o o p a io a a d peri e a e e of e i ro o*

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D L Schmidt Sen D ogard Film cooling with compound angle holes diabatic effectiveness *rbo ac* vol pp

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M ritsch Schulz and S Wittig diabatic wall effectiveness measurements of film cooling holes with expanded exits SME J Turbomach vol no pp

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International Conference on Engineering, Natural Sciences and Technological Developments (ICENSTED)

July

Evaluation of Spectral Efficiency and Energy Efficiency (EE) of 5G Green Network (GN) Using Soft Computing Techniques

Mahmood Turkbhi, Ceyhun Sahar, Mobile Research

Network, Turkey

Abstract

The demand for wireless communication is constantly increasing, leading to the need for more energy efficient and environmentally friendly 5G networks. Soft computing techniques such as artificial neural networks, fuzzy logic, genetic algorithms, and machine learning have shown potential in optimizing the Spectral Efficiency (SE) and Energy Efficiency (EE) of 5G green networks. This paper presents a comprehensive review of recent studies evaluating the SE and EE of 5G green networks using soft computing techniques. The results of these studies show that soft computing techniques can significantly improve the SE and EE of 5G networks compared to traditional optimization techniques. The report also emphasizes the importance of continuous research and development in this field to create more energy efficient and environmentally friendly 5G networks.

Keywords: 5G networks, soft computing, energy efficiency, spectral efficiency

I. INTRODUCTION

Current studies have indicated that data throughput and the number of connected nodes in next generation wireless networks are expected to increase dramatically, leading to increasingly stringent requirements for spectral efficiency (SE) and energy efficiency (EE) [1]. To address these requirements, orthogonal frequency division multiplexing with index modulation (OFDM-IM) has been proposed, introducing an additional modulation domain and an extra degree of freedom [2]. Unlike conventional amplitude phase modulation (APM) schemes, OFDM-IM incorporates an index domain alongside the classic amplitude phase constellation diagram, resulting in a three-dimensional modulation scheme that significantly enhances SE under optimal system configurations [3].

OFDM-IM operates by activating only a subset of orthogonal subcarriers to create a unique subcarrier activation pattern (SP), which can be generated through subcarrier grouping and inverse fast Fourier transform (IFFT) [4]. This approach allows for a reduction in the number of legitimate SPs to a power of two, enabling the use of SP indices to modulate an additional bit stream in conjunction with the bit stream modulated by the data constellation symbols on active subcarriers. Consequently, under appropriate system configurations, OFDM-IM outperforms conventional OFDM in terms of SE and/or error performance [5].

The practical implementation of OFDM-IM in communication systems has also been validated, with results demonstrating its feasibility and effectiveness. Due to these advantageous properties, OFDM-IM has garnered significant attention from researchers and is considered one of the most promising modulation techniques for next-generation networks [6].

Furthermore, various enhanced OFDM-IM schemes have been proposed to further improve SE. Efficient subcarrier/subblock mapping schemes, independent index modulation on the in-phase and quadrature components [7], and hybrid techniques that jointly explore I and Q dimensions are among the methods that have been shown to achieve higher SE. These advancements, combined with cooperative multihop architectures and power allocation techniques, illustrate the potential of OFDM-IM to meet the SE and EE requirements of future wireless networks [8].

Experiments showed that soft computing techniques significantly improved the SE and EE performance of 5G green networks [9].

Simulations using artificial neural networks (ANNs) achieved significant improvements in energy efficiency and spectral efficiency compared to traditional optimization techniques. ANNs utilize historical data to model and predict network performance, adapting to various conditions and ensuring optimal performance even under

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fluctuating network states For instance in a stud conducted on the application of NNs in G networks it was found that the integration of these networks resulted in a increase in spectral efficienc and a reduction in energ consumption]

Fuzz logic based approaches have also been demonstrated to be highl effective in enhancing energ efficienc while maintaining robust network performance Fuzz logic s stems manage uncertainties and gradual changes in network parameters b using fuzz sets and rules which provide more nuanced decision making capabilities compared to binar logic s stems For example a stud implementing fuzz logic in G networks reported an increase in spectral efficienc and a decrease in energ usage highlighting the flexibilit and effectiveness of fuzz logic in handling complex network conditions]

Studies using genetic algorithms have demonstrated notable increases in spectral efficienc G s simulate natural selection processes to find optimal solutions for network configuration and operation evolving a population of potential solutions through crossover and mutation G s can effectivel optimize network parameters for better performance specific stud on the use of genetic algorithms in G networks reported a increase in spectral efficienc demonstrating the substantial impact of G s on enhancing network performance]

In summar the integration of these soft computing techniques NNs fuzz logic and G s into the evaluation framework for G green networks provides a comprehensive and effective approach to improving both spectral efficienc and energ efficienc These methods offer adaptable scalable solutions that cater to the d namic and complex nature of modern G networks supporting the development of more sustainable and efficient communication infrastructures]

ERI N E O

This stud emplo s advanced soft computing techniques to thoroughl evaluate the spectral efficienc SE and energ efficienc EE performance of G green networks Given the d namic and complex nature of G networks traditional methods often fall short in adapting to the rapidl changing network conditions and diverse user requirements To address these challenges we integrated artificial neural networks NNs fuzz logic and genetic algorithms G s into our evaluation framework

rtificial Neural Networks NNs rtificial neural networks were utilized to model and predict network performance based on historical data NNs known for their powerful pattern recognition capabilities were trained using extensive datasets that capture various network conditions user behaviors and traffic patterns The adaptive learning capabilit of NNs allows them to continuousl update and improve their predictions ensuring optimal network performance even under fluctuating conditions

Fuzz ogic Fuzz logic was emplo ed to handle the inherent uncertainties and vagueness in network parameters and user requirements incorporating fuzz sets and rules our s stem can make more nuanced decisions compared to binar logic s stems For instance fuzz logic allows the evaluation s stem to consider partial truth values providing a more flexible and realistic assessment of network performance This approach is particularl effective in scenarios where precise data is unavailable or where parameters exhibit gradual changes rather than abrupt transitions

Genetic lgorithms G s Genetic algorithms were applied to optimize the configuration and operation of network components G s simulate the process of natural selection b generating evaluating and evolving a population of potential solutions over multiple iterations Each solution represents a specific set of network parameters emplo ing crossover and mutation operations G s explore a wide range of possible configurations ultimatel converging on the optimal setup that maximizes SE and EE This optimization process is crucial for maintaining high performance in G networks where resource allocation and management must be d namicall adjusted in real time

Evaluation Framework The integration of these soft computing techniques into a cohesive evaluation framework provides a robust tool for assessing the performance of G green networks The framework operates as follows

- ata ollection omprehensive datasets encompassing various network conditions traffic loads and user behaviors are collected
- Model Training and alibration NNs are trained on the collected data while fuzz logic rules are defined based on expert knowledge and empirical observations The initial population for G s is generated representing diverse network configurations

□

□ Performance Simulation □The trained models and defined rules are applied to simulate network performance □ under different scenarios □The G □ iterativel □evolves the network configurations to identif □the optimal setup □
□ Evaluation and □nal □sis □The SE and EE of the network are evaluated using the optimized configurations □The □ results are anal □zed to identif □ke □factors influencing performance and to validate the effectiveness of the □ proposed techniques □

□

Outcomes and Implications □The results of this stud □demonstrate the significant potential of soft computing □ techniques in enhancing the efficienc □and sustainabilit □of □G networks □□ □leveraging the learning capabilities □ of □□NNs □the flexibilit □of fuzz □logic and the optimization power of G □s □the proposed framework adapts to □ d □namic network conditions and user requirements □providing a scalable and effective solution for next generation □ network management □□

□

This comprehensive approach ensures that □G networks can meet the increasing demands for higher data rates and □ reduced latenc □while maintaining energ □efficienc □□thereb □supporting the development of sustainable and □ resilient communication infrastructures □□

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The experiments conducted in this stud □demonstrated a substantial improvement in the performance of □G green □ networks through the application of soft computing techniques □□

□

The application of artificial neural networks □□NNs □led to significant enhancements in both spectral efficienc □□ SE □and energ □efficienc □□EE □□The adaptive learning capabilities of □□NNs allow the network to optimize its □ performance continuousl □based on historical data and real time conditions □□This results in improved overall □ network efficienc □□showcasing the potential of □□NNs in d namicall □adjusting to network conditions and □ ensuring optimal performance □□

□

Fuzz □logic based approaches were also found to be highl □effective in optimizing the performance of □G □ networks □These s □stems manage uncertainties and gradual changes in network parameters □offering more nuanced □ decision making capabilities compared to binar □logic s □stems □□The adaptabilit □of fuzz □logic makes it □ particularl □valuable in d namic network environments □□where it can significantl □enhance SE and EE □□

□

The use of genetic algorithms □G □s in □G networks resulted in notable improvements in spectral efficienc □□G □s □ simulate natural selection processes to find optimal solutions for network configuration and operation □□□evolving □ a population of potential solutions through crossover and mutation □G □s can effectivel □optimize network □ parameters □enhancing overall network performance □□

□

These results collectivel □underscore the potential of soft computing techniques to significantl □improve the □ efficienc □and sustainabilit □of □G green networks □□

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The findings of this stud □highlight the significant potential of soft computing techniques in optimizing the SE and □ EE of □G green networks □□The use of artificial neural networks □fuzz □logic □and genetic algorithms has □ demonstrated substantial improvements in network performance metrics □Specificall □□□NNs showed considerable □ improvements in SE and EE □while fuzz □logic approaches achieved notable enhancements in managing network □ parameters □Genetic algorithms contributed significantl □to optimizing network configurations □showcasing their □ strength in exploring optimal solutions □□

□

These results emphasize the importance of integrating intelligent s □stems to manage the growing complexit □and □ energ □demands of next generation networks □Future research should focus on refining these models and exploring □ their implementation in real world □scenarios □□dditionall □□h brid approaches that combine the strengths of □ multiple soft computing techniques could further enhance network performance □□

□

In conclusion □the application of soft computing techniques offers a promising pathwa □for developing sustainable □ and efficient □G networks □□ □leveraging the learning capabilities of □□NNs □the flexibilit □of fuzz □logic □and the □ optimization power of G □s □this stud □provides a comprehensive framework for improving SE and EE in □G green □ networks □□ontinued research and development in this area will be crucial for meeting the increasing demands of □ modern communication networks □□

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These findings highlight the significant role of advanced computational techniques in addressing the challenges posed b the ever increasing demand for wireless communication and the necessit for energ efficient solutions

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Inte national onfe ence on Enginee ing Natu al Sciences and Technological evelopments I ENSTE

Jul

a ke Shelf Products Detect on and Recogn t on Us ng O O a e NN and SSD Mob lenet

laa ohamed Jamel Abdulqader Mawlawi

tat rk U iv rsit Er r m T rki

Abstract

This stud evaluates the pe fo mance of va ious deep lea ning models fo the automatic detection and ecognition of p oducts on supe ma ket shelves T aining and testing e e conducted on a la ge dataset using O O Faste R NN and SS Mobilenet models The esults include a compa ison of each model in te ms of accu ac m P and total loss The findings demonst ate the effectiveness of automated p oduct ecognition s stems hich can p ovide significant benefits in invento management and custome se vice

O O Fast r NN Mobil t

INTRODUCTION

Visual p oduct ecognition is a contempo a compute vision p oblem aiming to detect and classif individual p oducts in a supe ma ket envi onment Potential applications of this technolog include automated checkout s stems eal time invento management and assistive technolog fo the visuall impai ed eep lea ning models offe effective solutions fo visual p oduct ecognition though the amount of labeled data equi ed fo t aining is not easil obtained This stud investigates p oduct detection and ecognition using O O Faste R NN and SS Mobilenet models fo the supe ma ket p oduct ecognition p oblem

The impo tance of visual p oduct ecognition lies in its potential to impact a ide ange of a eas f om invento management to custome satisfaction in supe ma kets Implementing this technolog allo s supe ma kets to automate invento t acking and manage it mo e effectivel Quick and accu ate p oduct identification helps detect empt spaces on shelves instantl ensu ing shelves a e al a s stocked dditionall the s stem can anal ze p oduct f equenc and popula it making demand fo ecasts and p oviding data necessa fo developing sales st ategies

Studies on visual p oduct ecognition highlight the effectiveness of deep lea ning models] p oposed the ScaleNet method aiming to c eate object p oposals b estimating object sizes in supe ma ket images This method has imp oved the object p oposal p ocess fo supe ma ket images] developed a class disc iminative object p oposal method capable of detecting small objects achieving a faste pe fo mance compa ed to the cu ent best

The apid development of deep lea ning techniques has made deep convolutional neu al net o ks NNs inc easingl impo tant in object detection ompa ed to t aditional handc afted featu e based methods deep lea ning based object detection methods can lea n both lo level and high level image featu es]] p oposed a solution in the fo m of an automatic data s nthesis pipeline capable of gene ating t aining data fo la ge scale p oduct detection and classification This method achieves high detection accu ac on eal data using s nthetic data

ombining machine lea ning techniques ith deep lea ning models can ield mo e effective esults Fo example] used masked R NN and data augmentation techniques to pe fo m object detection in etail p oduct detection This method minimized e o s caused b ove lapping o simila l colo ed objects] p oposed a multi modal f ame o k fo p oduct discove and classification This f ame o k pe fo ms p oduct detection using ascade R NN and s itchable convolutional po e

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N O

In this stud O O Faste R NN and SS Mobilenet models e e used to detect and ecognize p oducts on supe ma ket shelves dataset as c eated using images obtained f om supe ma ket chains in E zu um The dataset as meticulousl labeled using the abelImg labeling tool Each model s t aining and testing e e pe fo med and thei pe fo mances e e evaluated based on m P Mean ve age P ecision and total loss c ite ia

u ing data collection photos e e taken in indoo ma kets unde va ious lighting conditions and angles The came a used in the shoots as a high esolution digital came a capable of obtaining clea images even in lo light conditions The labeling p ocess as ca ied out ca efull dete mining the position t pe and othe distinguishing featu es of each p oduct The labeled dataset as sto ed in JSON fo mat fo eas access and anal sis in subsequent stages

T aining and testing p ocesses e e conducted fo each model O Ov Faste R NN and SS Mobilenet models e e used and the accu ac and total loss values of each model e e compa ed Va ious met ics e e used to evaluate the pe fo mance of the models du ing the t aining p ocess

R SU TS

In the expe iments the O Ov model achieved high accu ac ates and pe fo med bette than othe models The Faste R NN and SS Mobilenet models also p ovided satisfacto esults but lagged behind the O Ov model Model pe fo mances e e examined in detail th ough compa ative anal ses conducted on the c eated dataset

In the expe iments p oduct detection and ecognition on supe ma ket shelves e e pe fo med using O Ov Faste R NN and SS Mobilenet models The t aining data consisted of images taken f om supe ma ket chains in E zu um These images e e taken f om va ious angles and lighting conditions and meticulousl labeled using the abelImg labeling tool

The O Ov model stands out ith its high accu ac ates and lo loss values cco ding to the esults obtained the m P value of the O Ov model as eco ded as and the total loss value as This model is notable fo its fast ope ation capabilit and lo computational cost The O Ov model is especiall advantageous fo eal time applications and use on light eight mobile devices



igure O Ov

The Faste R NN model also had satisfacto accu ac ates but sho ed highe loss values and longe p ocessing times The m P value of the Faste R NN model as dete mined to be and the total loss value as This model can be p efe ed in applications he e high accu ac is equi ed but p ocessing time is not c itical In te ms of p ocessing time the Faste R NN model is slo e compa ed to the O Ov model



igure Faste R NN

The SS Mobilenet model stands out ith its fast p ocessing time and lo computational cost o eve its accu ac ates lag behind the othe t o models The m P value of the SS Mobilenet model as eco ded as and the total loss value as This model is suitable fo eal time applications and light eight mobile devices



igure SS Mobilenet

ompa ing model pe fo mances sho s that the O Ov model has the highest accu ac ates and the lo est loss values The Faste R NN model also pe fo med ell but lagged behind the O Ov model in te ms of p ocessing time and loss values The SS Mobilenet model hile notable fo its fast p ocessing time and lo computational cost lagged behind the othe models in te ms of accu ac ates

CONC USION

The esults obtained f om this stud highlight the significant capabilities of deep lea ning models in detecting and ecognizing p oducts on supe ma ket shelves The O Ov model ith a mean ave age p ecision m P of and a total loss of demonst ates supe io accu ac and efficienc making it an excellent tool fo invento management and custome se vice in supe ma kets Its fast p ocessing time of ms pe image also suppo ts its suitabilit fo eal time applications and deplo ment on light eight mobile devices

In compa ison the Faste R NN model although achieving a satisfacto m P of exhibited highe loss values and longe p ocessing times ms This model can be pa ticula l beneficial in scena ios he e

high accu ac is c itical and p ocessing time is less of a conce n Its pe fo mance indicates potential fo applications equi ing detailed and p ecise p oduct ecognition

The SS Mobilenet model hile noted fo its fast p ocessing time ms and lo computational cost sho ed lo e accu ac ates ith an m P of and a total loss of espite this it emains a viable option fo eal time applications he e computational esou ces a e limited Its efficienc makes it suitable fo d namic envi onments he e immediate p oduct ecognition is necessa

In conclusion the stud unde scoes the effectiveness of integ ating deep lea ning models like O Ov Faste R NN and SS Mobilenet into supe ma ket s stems to enhance invento management and custome satisfaction Futu e esea ch should focus on efining these models to fu the imp ove thei accu ac and obustness explo ing h b id app oaches that combine the st engths of multiple models and adapting these technologies to dive se etail envi onments The integ ation of these advanced models can evolutionize etail ope ations leading to mo e efficient and accu ate invento management educed aste and enhanced shopping expe iences fo custome s

Table ompa ison of models

Model	m P	Total oss	P ocessing Time
O Ov			ms
Faste R NN			ms
SS Mobilenet			ms

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Inte national onfe ence on Enginee ing Natu al Sciences and Technological e elopments I ENSTE

Jul

E er Efficie c E al a io of G Radio cce Ne ork i F o ic a d NF

o a ed ad dil ali i

a r r Er r r

b rac

s the demand fo G netwo ks continues to escalate the challenge of imp o ing ene g efficienc within these netwo ks becomes inc easingl c itical This esea ch in estigates the application of fuzz infe ence s stem FIS and adapti e neu o fuzz infe ence s stem NFIS to e aluate ene g efficienc algo ithms fo G adio access netwo ks R N le e aging the st engths of both fuzz logic and neu al netwo ks this stud p oposes inno ati e methodologies to optimize powe consumption the eb enhancing o e all netwo k sustainabilit The findings demonst ate the potential of FIS and NFIS in significantl educing ene g usage in G R N making it a iable app oach fo futu e netwo k design and management

G netwo ks NFIS FIS R N

N RO ON

The ad ent of G technolog ma ks a significant e olution in cellula netwo ks p omising enhanced data ates educed latenc and massi e connecti it owe e these ad ancements come at the cost of inc eased ene g consumption p ima il due to the p olife ation of base stations and the complexit of signal p ocessing loud Radio ccess Netwo ks R N ha e eme ged as a p omising solution to add ess ene g efficienc b cent alizing baseband p ocessing in the cloud This pape focuses on e aluating ene g efficienc in G R N using FIS and NFIS highlighting thei abilit to handle the unce taint and non linea it inhe ent in such s stems

Recent esea ch on ene g efficienc in G technolog has ga ne ed significant attention pa ticula l conce ning the optimization of ene g consumption in complex s stems like G Radio ccess Netwo ks R N Enhancing ene g efficienc in these netwo ks is c ucial fo both en i onmental sustainabilit and educing ope ational costs Va ious app oaches to imp o e ene g efficienc ha e been examined in the lite atu e

In stud] add esses the optimization of ene g efficienc in G adio f equenc chain s stems anal zing the effects of diffe ent pa amete s This wo k demonst ates how optimizing ene g efficienc can imp o e o e all s stem pe fo mance Simila l in esea ch] explo es the effecti eness of e olutiona algo ithms in cloud computing f om the pe specti e of ene g consumption highlighting the benefits of these algo ithms in enhancing ene g efficienc in cloud en i onments

The use of a tificial intelligence techniques such as fuzz logic and NFIS in e aluating ene g efficienc has also been extensi el documented in the lite atu e In stud] de eloped a fuzz logic based admission cont ol s stem and e aluated its pe fo mance in G wi eless netwo ks This esea ch illust ates the potential effecti eness of fuzz logic app oaches in G netwo ks

dditionall in stud] p oposed an NFIS based e aluato fo assessing the pe fo mance of the RS c ptos stem in cloud netwo king This stud highlights how NFIS can be effecti el utilized to e aluate ene g efficienc in complex s stems

These lite atu e e iews indicate that fuzz logic and NFIS a e powe ful tools fo enhancing ene g efficienc in G R N The integ ation of these intelligent s stems in futu e netwo k design and management can significantl imp o e ene g efficienc as e idenced b the findings in a ious studies

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ER N E O

The esea ch emplo s T fo simulating the p oposed models Two basic app oaches a e int oduced below

F fe ce e F

The amdani t pe FIS combines multiple ene g efficient pa amete s such as powe numbe of use s noise powe numbe of antennas and tempe atu e to gene ate a comp ehensi e e aluation FIS le e ages fuzz logic to manage imp ecise inputs enabling a nuanced anal sis of ene g efficienc

ethodolog The FIS model was designed to inco po ate multiple inputs and one output The p ima pa amete s included powe numbe of use s noise powe numbe of antennas and tempe atu es

Implementation T e sion a was used fo all simulations and expe iments utilizing the FIS NFIS tools within T to facilitate the e aluation p ocess T iangula membe ship functions we e chosen fo the pa amete s due to the obse ed linea elationships The R ope ation was used instead of N to ensu e that each pa amete could significantl influence the final output

da i e Ne o F fe ce e NF

NFIS integ ates fuzz logic with neu al netwo ks enhancing the s stem s adaptabilit and lea ning capabilities It t ains on data to fine tune the membe ship functions and fuzz ules the eb optimizing the ene g efficienc e aluation p ocess

T aining and Testing NFIS was t ained using input alues and the e aluation esults obtained f om FIS The s stem was then tested with a diffe ent set of input alues not used du ing the t aining phase to assess its pe fo mance

RE

actical implementations of e aluation app oaches fo Ene g Efficient b id owe ed loud Radio ccess Netwo k R N fo G we e conducted Two main cont ibutions a e highlighted

F fe ce e F

a amete s owe numbe of use s noise powe numbe of antennas and tempe atu es

Implementation T simulations using amdani t pe FIS with t iangula membe ship functions and R ope ations

Fi stl the ules co e all the inputs output possibilities b using se e al statements Secondl the R ope ation is empi icall used instead of the N ope ation This is because the N ope ation conside s the minimum a ea du ing the execution So if the minimum a ea is being ze o fo an input pa amete this will p o ide a bad impact to the output alue In cont ast the R ope ation conside s the maximum a ea between the combined inputs and this will alwa s p o ide an influenced output alue Finall onl the owe has a descending membe ship function o de and all othe inputs output ha e an ascending membe ship function o de The eason be ond this is that logicall when the owe is low and othe Ene g Efficient pa amete s a e complicated this can be conside ed as best pe fo mance n the othe hand when the owe is high and othe Ene g Efficient pa amete s a e less complicated this can be conside ed as the wo st pe fo mance

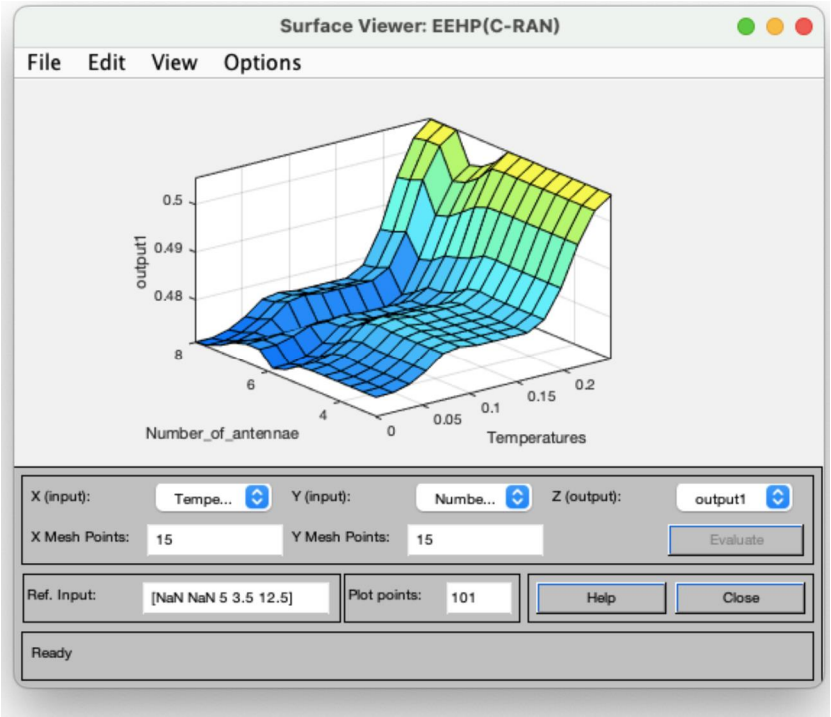
da i e Ne o F fe ce e NF

T aining and Testing T aining with FIS esults testing with new input alues

e fo mance chie ed lowest e o alues with Gauss mf function

Findings su face esults confi med accu ate e aluations demonst ating NFIS s abilit to model complex elationships

Figu e confi ms that the elationships between the inputs and the output a e based on fuzz computations In othe wo ds if the elationship is demonst ated b a pu el flat su face this means that the FIS does not wo k well The efo e this is fu the e idence of successi el implementing the FIS Simila findings ha e been obse ed b changing an input s



Fi re The su face of the FIS window of two inputs plaintext size and execution time and the output e aluation fo EE R N

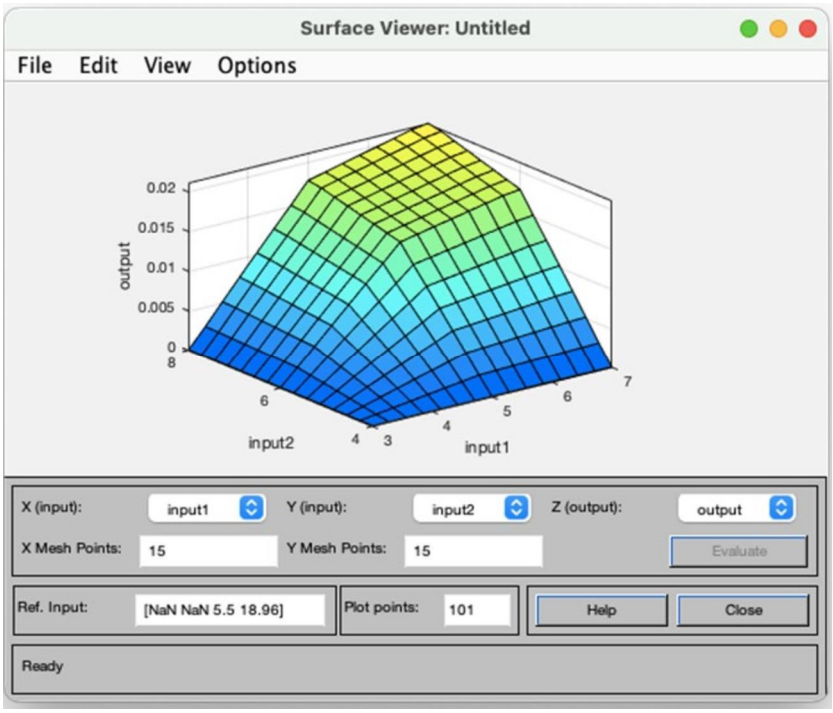
In Table it can be noticed that the neu o fuzz netwo k consists of fi e la e s input inputmf ule outputmf and output ence the input la e ep esents the input pa amete s in this wo k the inputmf la e dist ibutes each input to main fuzz membe ships low medium and high This means the inputs with the main membe ships will c eate neu ons in this la e fo the EE R N Then each neu on in this la e will send connections to the ule la e whe e each neu on in this la e ep esents the if then ule condition e eafte the next la e output will inte p et the conditions f om the p e ious la e to le els Finall the mean of these le els will be calculated to obtain the final output alue f om the last la e output Figu e explains the su face iewe s of the p oposed NFIS models fo EE R N the ha e been depicted afte the t aining phase

able The tested EE R N e o alues b using diffe ent membe ship function

embe ship function	E o tole ance
T imf	
T apmf	
Gbellmf	
Gaussmf	
Gauss mf	
imf	
sigmf	
sigmf	

In Table demonst ates the st uctu e models that used in this t pe of e aluato whe e the inputs ep esent e aluation pa amete s fo the EE R N ne output can be seen in st uctu e it p o ides the estimated e aluation alue

gain Figu e confi ms the success of the suggested NFIS models in thei t aining whe e the p oduced fuzz su faces not pu e flat su faces fte completing the NFIS establishment aluable softwa e inst uctions ha e been implemented to examine the NFIS b using a la ge numbe of alues These inst uctions can be emplo ed to execute the NFIS in eal time



Fi re The NFIS esulted su face fo EE R N

ON ON

This stud p esents a no el application of FIS and NFIS in e aluating ene g efficienc in G R N The findings unde sco e the impo tance of integ ating intelligent s stems to manage the g owing complexit and ene g demands of next gene ation netwo ks The esults indicate that using both FIS and NFIS p o ides obust tools fo e aluating ene g efficienc in h b id powe ed cloud adio access netwo ks fo G The p actical implementations demonst ated in this stud show significant potential fo eal time applications offe ing a iable app oach fo futu e netwo k design and management Futu e esea ch will focus on efining these models and explo ing thei implementation in eal wo ld scena ios to fu the alidate thei effecti eness and adaptabilit

Refere ce

] R i Ge J Thompson ang and T an Ene g efficienc optimization of G adio f equenc chain s stems IEEE Jou nal on Selected eas in ommunications ol no pp

] a am Sa da az and Tahi E olutiona algo ithms in cloud computing f om the pe specti e of ene g consumption e iew in *r a a r E r E*

] uzzoc ea mp i it F Fu fa o E afzezi Sacc 1 kbashi and a olli new admission cont ol s stem fo G wi eless netwo ks based on fuzz logic and its pe fo mance e aluation *r a a r a r a ol no pp*

] S Sadkhan and F bdul aheem p oposed NFIS e aluato fo RS c ptos stem used in cloud netwo king in *r a a r rr ar r a r a*

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d p opo a of a m o g a q om o k o am q o a dom a o da a a o m d ff f om ad o a m p k p q o f om a da aba a dom p opo d m g a da a a dom o fo a d a a ob q o abo da a Ea q o o a a o a pa a d a a ab pa a g f om d o d a dom o o o a a o b a o g a d fo a d p o o p m a b q o g a d a b d b d fo f d o a a o g ad d om o k am b fa m mb m a a d a g b off g ma p a q o o o a d a a fa ff b p o d g a o g a d g ad d q o l a a o b a o o aga a g a oom g g a I k a G m a b d g g da a a d b a a p og am

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I ter atio al o fere ce o E gi eeri g Nat ral Scie ces
a d Tech ological Developme ts I ENSTED

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Unal ilma

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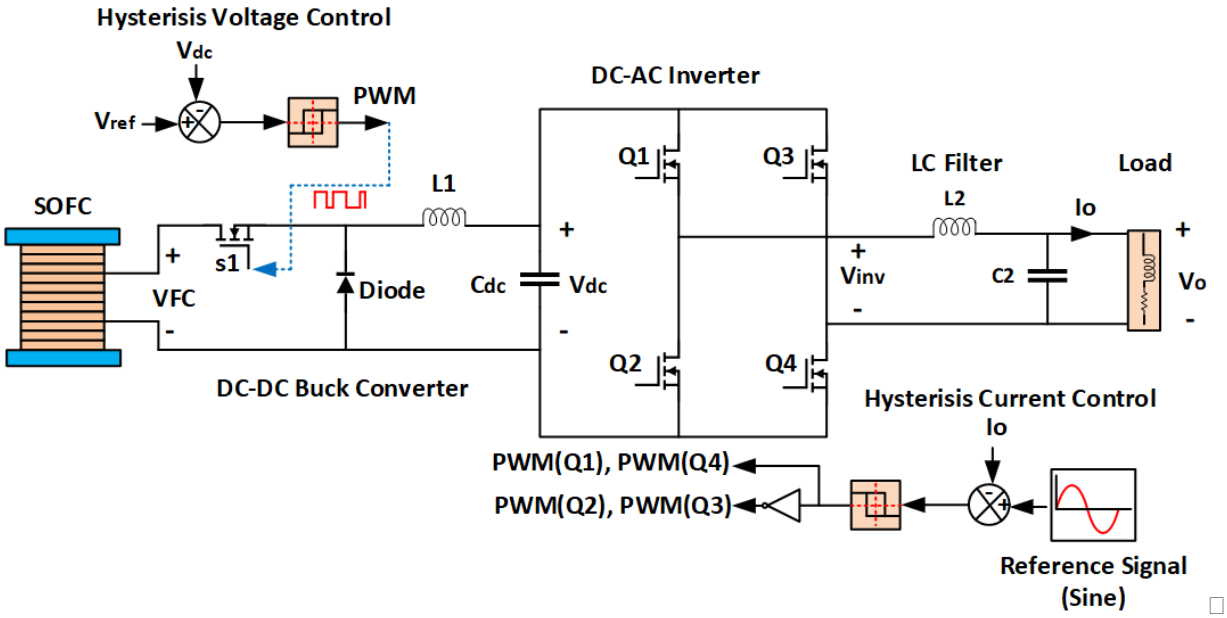
rre t a d voltage co trol tech iq es of the po er electro ics i terface are eeded to e s re stable a d s stai able e erg tra sfer bet ee the po er s ppl a d the load to dampe the total harmo ic distortio a d to reg late the po er factor Determi i g the proportio al a d i tegral gai val es of traditio al pi based co trol methods is a diffic lt a d complex process a d the applicatio performa ce is ge erall ot at satisfactor levels Therefore the h steresis co trol method hich is relativel eas to appl a d provides effective res lts as preferred i this st d The po er circ it i terface is desig ed for a motor applicatio ith a solid oxide f el cell SOF po er s ppl D D step do co verter voltage co trol for the co ection bet ee SOF a d the i verter as ell as load c rre t co trol are provided b the h steresis based PWM ge eratio tech iq e over the i verter The aim of this st d is to e s re lo harmo ics lo voltage ripple a d reg lar po er factor b providi g i verter i p t voltage a d load c rre t co trol I this st d Matlab Sim li k sim latio program as sed for circ it desig a al sis a d comp ter applicatio

ere o rol SOF rre a ol age co rol Mo or appl ca o

NTRO U T ON

F el cells take their place i the literat re as a re e able e erg so rce that ca prod ce electrical voltage as a res lt of chemical reactio s bet ee h droge a d ox ge igh efficie c flexibilit of se a d abilit to perform i a ide temperat re ba d make f el cells competitive amo g re e able e erg so rces] D e to their abilit to perform efficie tl at high temperat res a d se differe t h drocarbo f els SOF f el cells are preferred as a e erg prod ctio so rce i heat po er ge erators a d reside ces] For i d strial loads fed b re e able e erg so rces there is a eed to desig po er electro ic co verters bet ee the po er s ppl a d the load mo g these po er circ its the dc dc co verter is sed to reg late the level of voltage prod ced b the f el cell a d to keep the i p t voltage of the dc ac i verter at the refere ce val e To perform these operatio s voltage co trol methods are eeded Morover dc ac i verters are sed to co vert dc e erg i to ac e erg for electrical load to reg late load c rre t a d voltage to s ppress harmo ic distortio a d to reg late the po er factor I addition i order to perform harmo ic s ppressio bet ee the dc ac i verter a d the load L L L L etc available i the literat re filters are sed fter the ph sical co ection bet ee the electrical load a d the po er so rce is established both the voltage co trol method to keep the voltage at the refere ce val e i the dc dc co verter a d the c rre t co trol methods to provide reliable a d appropriate c rre t from the dc ac i verter to the electrical load ill be eeded] I this co text the steresis co trol method attracts atte tio d e to its ease of applicatio a d abilit to follo variable refere ce val es] Therefore i this st d h steresis co trol method as applied for both voltage a d c rre t co trol The circ it str ct re a d co trol schemes desig ed for the proposed st d are prese ted i Fig re



□i□re □□□Proposed s□stem model□

I□this st□d□as see□i□Fig□re □□□SOF□□□as□sed as the po□er so□rce a□d a dc□dc b□ck co□verter□□as desig□ed□ for the po□er circ□it exte□di□g to the i□verter co□□ection□I□order to provide e□erg□flo□□to the electrical load□a□ dc□ac f□ll bridge si□gle phase i□verter a□d L□□filter desig□for harmo□ic s□ppressio□have bee□carried o□t□□

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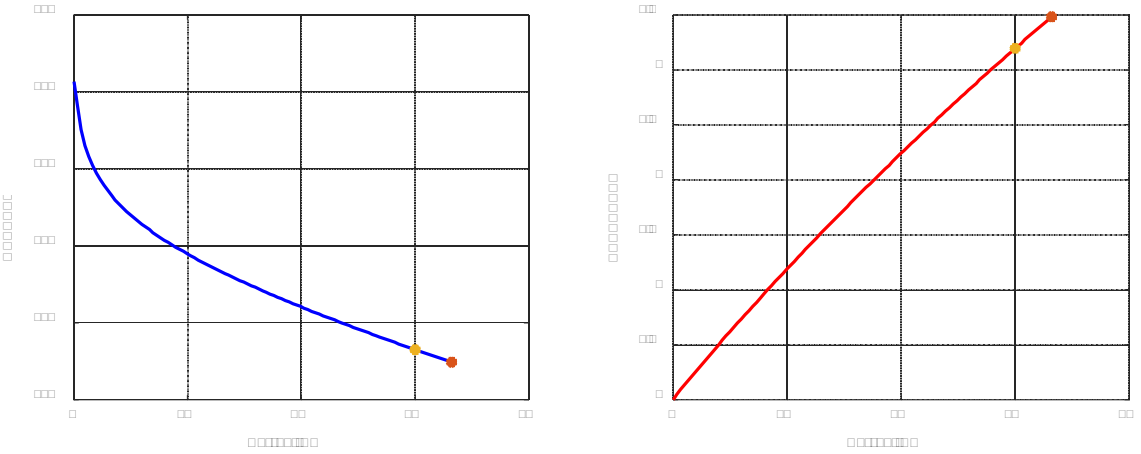
For the first step of the st□d□□the□□□steris□voltage co□trolled□D□□D□□□□ck□□o□verter desig□□□as realized as□ sho□□i□fig□re□□□to keep the voltage prod□ced b□the f□el cell at the refere□ce val□e SOF□f□el cell□c□rre□t□ voltage a□d c□rre□t po□er characteristic c□rves are prese□ted i□Fig□re □□□□



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The electrical properties a□d□eldi□g parameters of SOF□f□el cell are prese□ted i□Table□□□□

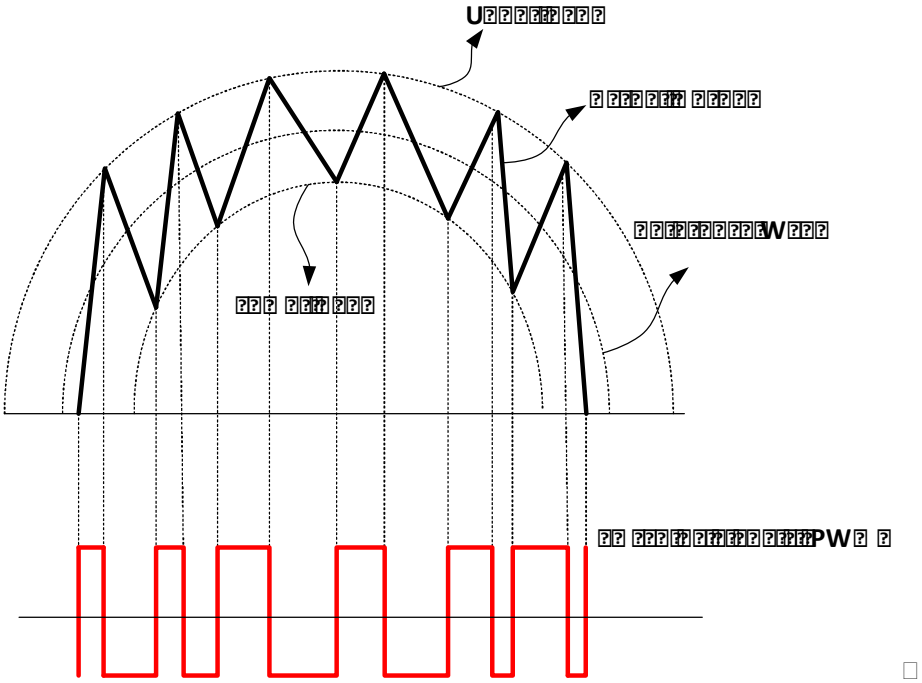
Table □□□Electrical properties of SOF□□

□oltage	Po□er	Temperat□re	Press□re F□el	Press□re□ir	Efficie□c□	N□mber of Series Stack
□□□□□□	□kW	□□□ °□	□□□□□□ar	□ □ar	□□□	□

The□ratio bet□ee□the i□p□t a□d o□tp□t voltages of the dc□dc b□ck co□verter is sho□□i□the follo□i□g eq□atio□□□

Where □the □□$_{F}$□SOF□f□el cell voltage □□$_{dc}$ o□tp□t voltage□D refers to the d□t□c□cle □□□]□□

□□sterisis voltage co□trol creates s□itchi□g impacts for voltage reg□latio□based o□the error sig□al a□d h□steresis□ ba□d□idth co□sisti□g of the differe□ce bet□ee□the refere□ce voltage a□d the meas□red val□e□The deviatio□of the□ act□al sig□al from the refere□ce voltage is called a□error sig□al□Th□s the error sig□al created is give□as a□i□p□t□ sig□al to the co□troller s□h□sterisis ba□d□The s□itchi□g occ□rs□□he□the error sig□al deviates be□o□d the refere□ce□ h□sterisis ba□d limit□If the error sig□al is above the refere□ce ba□d the s□itch o□□state error sig□al reaches lo□er□ levels a□d the s□itch ge□erates a sig□al for the off state□□□□□]□The basic str□ct□re of h□sterisis co□trol is prese□ted□ i□Fig□re□□□□



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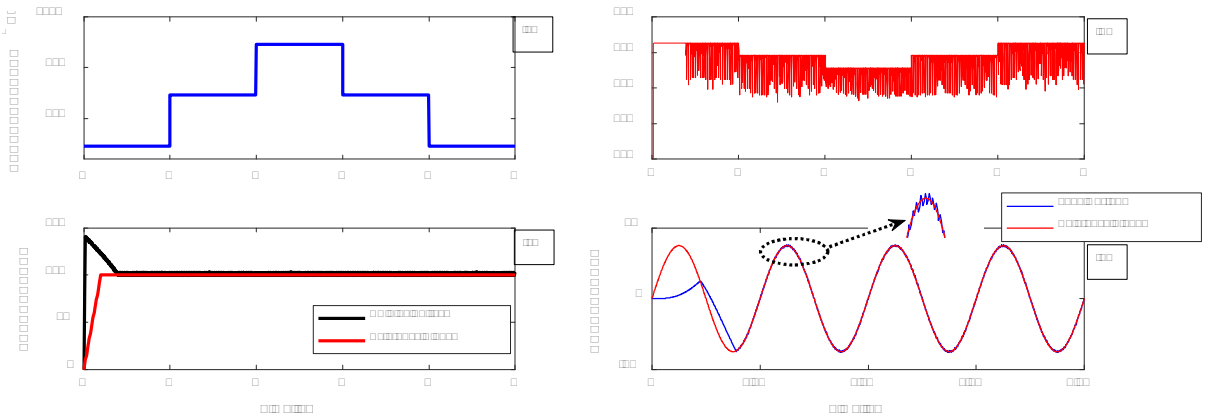

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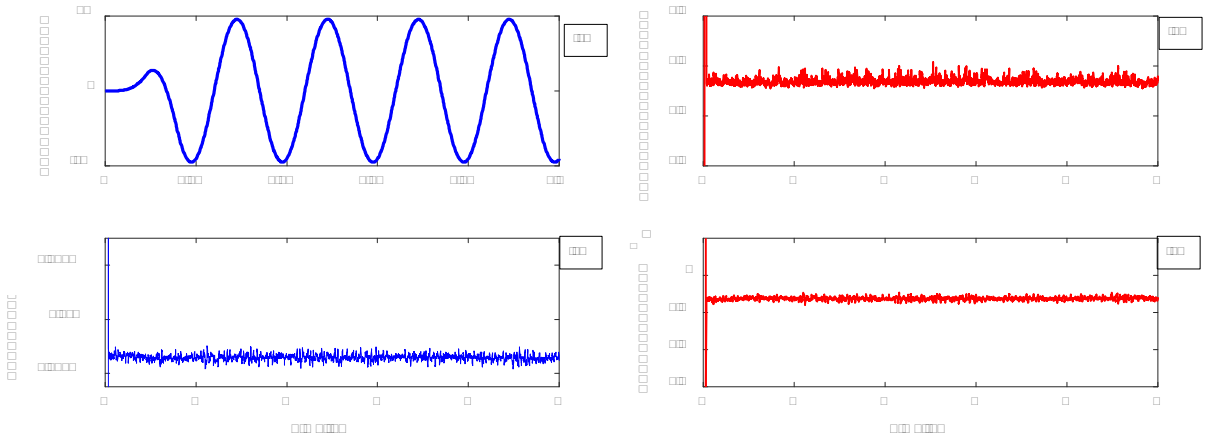

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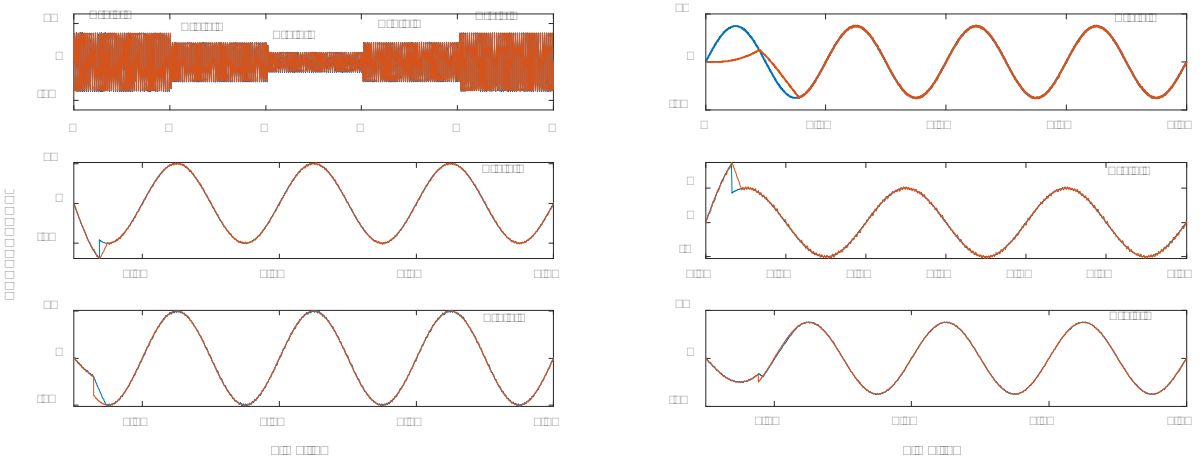

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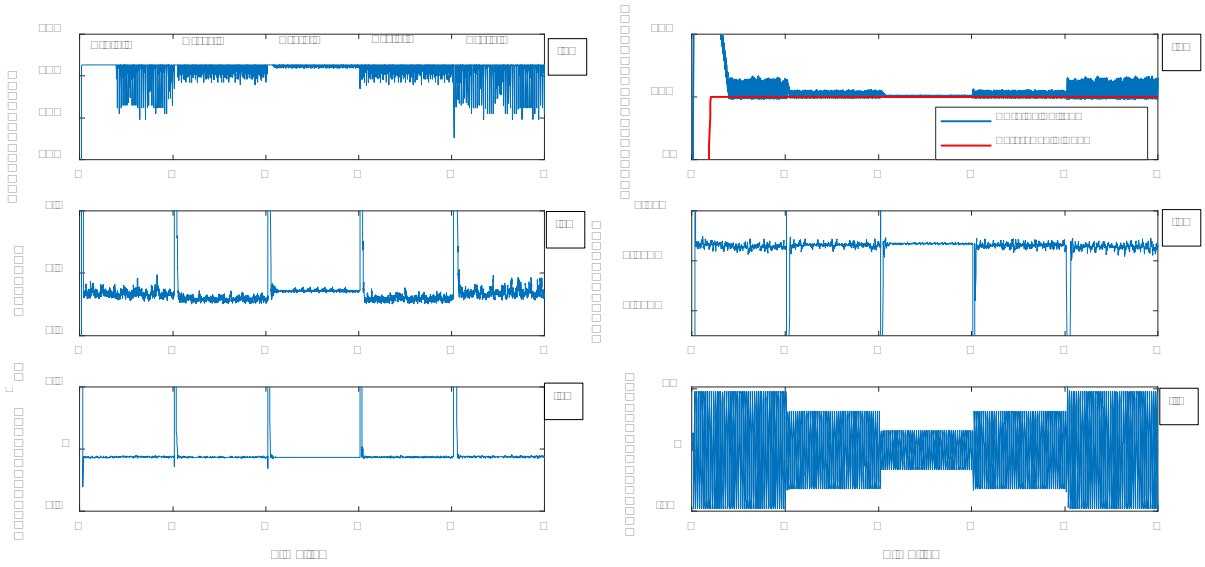

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I□ this st□d□ the po□er circ□it i□terface for e□gi□e□s ppl□as a SOF□ f□el cell po□er so□rce□ as modeled a□d its comp□ter applicatio□□□ as□impleme□ted□□□ L□load□□ as modeled for the motor a□d a dc dc b□ck co□verter□□ as desig□ed for the po□er i□terface i□ the first stage a□d a dc ac si□gle phase f□ll bridge i□verter□□ as desig□ed i□ the seco□d stage□ Fig□re □□□□ dditio□all□ a□ L□ filter□□ as applied d□e to its harmo□ic s□ppressio□ feat□re□□ □steresis voltage co□trol□□ as applied to the dc dc b□ck co□verter to e□s□re that the voltage prod□ced from the f□el cell remai□ed co□sta□t at the refere□ce val□e□ hile bei□g tra□sferred to the dc li□k a□d the res□lts are prese□ted i□ Fig□res□ c□a□d□ b□□□ □steresis c□rre□t co□trol is□sed to provide load c□rre□t co□trol□ The performa□ce of the desig□ed co□trol method□□ as tested at differe□t refere□ce val□es a□d satisfactor□res□lts□ere obtai□ed□ Fig□re□□□□ It is obvio□s that the proposed st□d□ ca□ be a stro□g alter□ative for sta□d alo□e or□ o□ grid co□ectio□s of differe□t re□e□able e□erg□s□stems□ P□s□stem□ Wi□d T□rbi□e□ etc□□ I□ the st□d□ s□stem modeli□g a□al□sis a□d sim□latio□□ □ere carried o□t i□ the Matlab Sim□li□k program□

References□

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International Conference on Engineering, Natural Science and Technological Development (ICENSTED)

July

Design of a Low Profile Metasurface Based Linear Polarization Converter for Radar Cross Section Reduction

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Abstract

In this study, a low profile metasurface based linear polarization (LP) converter operating in reflective mode for microwave X band (8-12 GHz) application is suggested. The suggested design created with metal termination, an easily accessible and inexpensive FR-4 substrate and a simple designed metasurface offers polarization conversion ratio (PCR) of over 99% in the frequency range of 8.2-12 GHz and over 90% in the frequency range of 7.8-12.4 GHz in the microwave X band. Moreover, the suggested LP converter design is rearranged with appropriate geometry and the radar cross section (RCS) reduction is provided to be over 10 dBsm in the microwave X band in the range of 8.2-12 GHz compared to the perfect electric conductor (PEC) plate of the same size with the created metasurface structure. The design and simulation application of LP and RCS reduction were carried out in the frequency range of 8-12 GHz using CST Microwave Studio, a commercial 3D electromagnetic simulator.

Keywords—Metasurface, linear polarization, broadband, RCS reduction

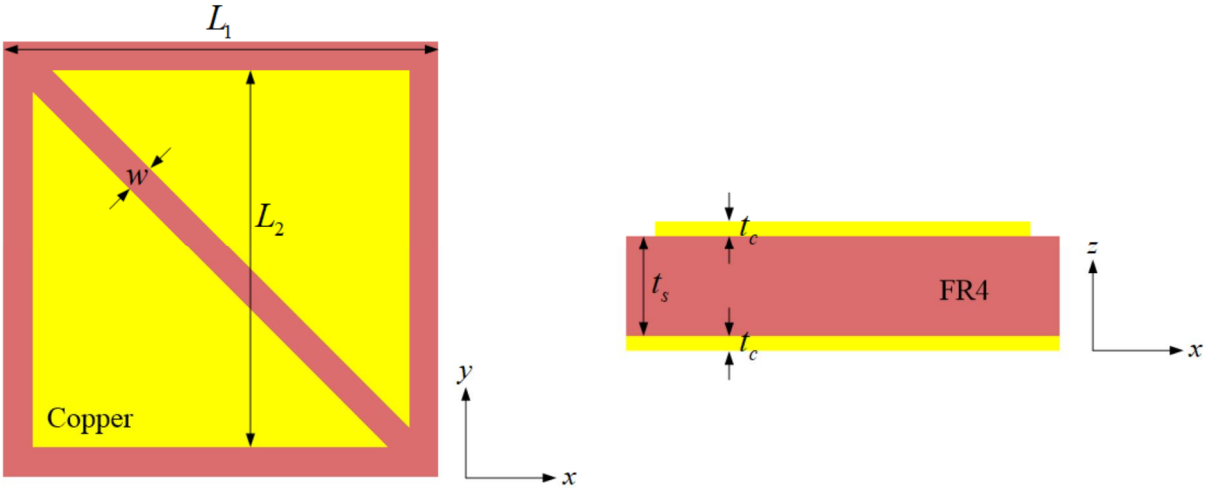
I. INTRODUCTION

Controlling the polarization of an electromagnetic wave is an important phenomenon in various application areas such as antenna [1], radar cross section [2], and remote sensing [3]. Therefore, polarization plays a vital role in the performance of microwave devices. Conventional polarization converters constructed with various methods such as optical grating and Faraday effect show limited performance due to reasons such as their large volume, narrow bandwidth, manufacturing difficulties, and power loss [4-5]. Therefore, conventional polarization converters are not suitable for practical applications. To eliminate the needed disadvantages, metasurface based polarization converters have been suggested instead of conventional polarization converters in recent years. In the microwave [6], terahertz [7], and infrared [8] frequency regions, the unit cell of metasurface based polarization converters can be designed in the reflective or transmittive mode as a single [9] or multilayer [10], and are also used in radar cross section (RCS) reduction applications by rearranging the unit cell with the appropriate geometry [11-12].

In this study, a metasurface based reflective mode linear polarization (LP) converter is suggested for microwave X band (8-12 GHz) applications. In the suggested converter design, FR-4 dielectric material with a thickness of 1.6 mm, which is widely used in the market and is cheap to supply, was used as the substrate material. While the suggested unit cell design shows LP conversion features over a wide frequency range in the microwave X band, it is also shown that this design can be used in RCS reduction applications by rearranging it with appropriate geometry.

II. CONFIGURATION AND DESIGN OF THE CONVERTER

The front and side surface views of the suggested metasurface based LP converter design are shown in Fig. 1(a) and 1(b), respectively. In the suggested design, a FR-4 dielectric material with a dielectric constant of 4.3 and a loss tangent of 0.025 with a thickness of 1.6 mm (h_2), which is widely used in the market and cheap to supply, is used as the substrate material. The square shaped substrate has a side of 20 mm (L_x). The bottom layer of the substrate is terminated with copper with a conductivity of 5.8×10^7 S/m and a thickness of 35 µm (t_c). The metasurface on the top layer is created with the same copper material by rotating a 0.5 mm (w) wide strip 90° counterclockwise and removing it from a square structure with a side of 18 mm (L_y).



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□n electromagnetic □wave □□□^{i} □traveling in the □□direction to the meta urface and having an electric field □ component in the □□direction □□□polarized can reflect □□□^{r} □in the ame direction co polarization i.e □□□polarized □□ or in the oppo ite direction cro □□polarization i.e □□□polarized □Similarl □□the oppo ite i true for the □□□polarized □ incident wave □□ccordingl □□for a □□polarized incident wave the co and cro □□polarized reflection coefficient are □□□ and □□$_{□□}$ = □$^{r□}$/□$^{i□}$ re pectivel □□□ere □□□$^{i□}$ repre ent □the component of the incident wave in the □□axi □while □ □$^{r□}$ and □□$^{r□}$ repre ent the component □of the reflected wave in the □□and □□axe □re pectivel □□□

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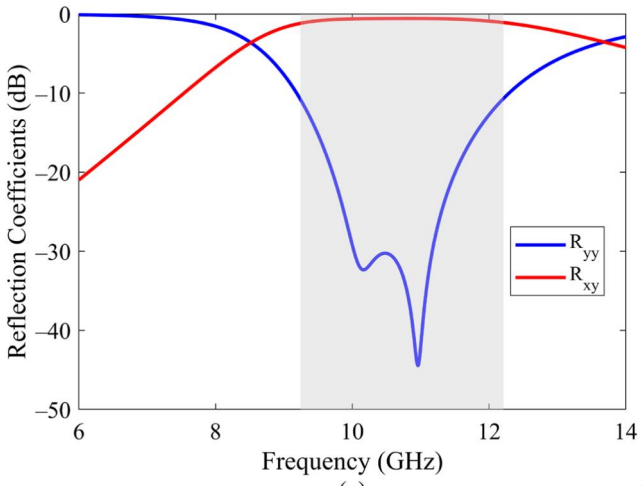
Polarization conver ion ratio □P□R i □u ed to evaluate the LP performance of the □ugge ted converter □For a □□□ polarized incident wave □the P□R i □calculated a follow □□□□



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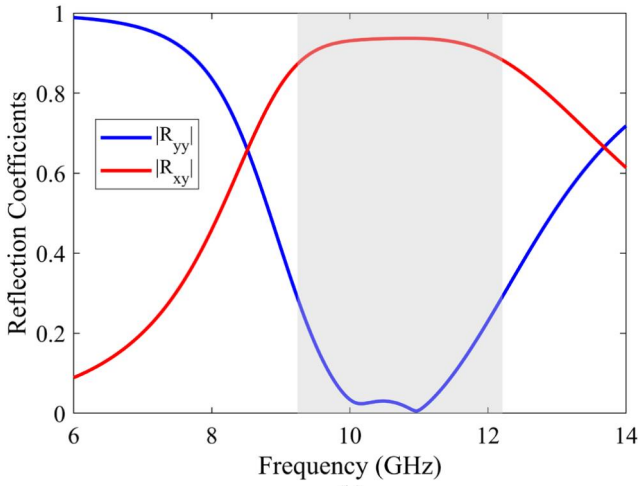

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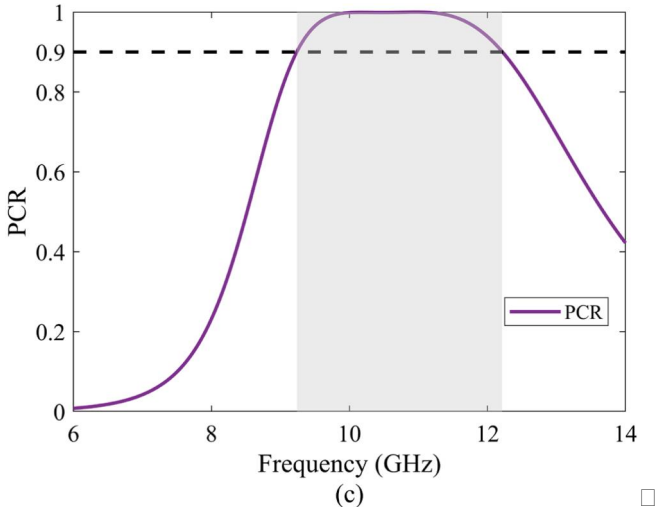

(c) □

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In □recent □ ear □□multi □functional □de ign □can □be □carried □out □b □□appropriatel □□modif ing □the □architecture □of □metamaterial □□In □particular □the unit cell □of LP □converter □i □u ed in R□S reduction □application □b □rearranging it □with □appropriate □geometr □□□□□□□□] □□For thi □purpo e □a new meta urface □tructure □of □□□□□□□ize wa □created b □□coding □□□□□□□□□ mean □the □ugge ted polarization □converter □de ign □rotated □□□° □clockwi e □and □□□mean □the □ugge ted polarization converter de ign □a □□hown in Fig □□a □for R□S reduction b □u ing the □ugge ted converter□

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de ign □In Fig □□b □the meta urface □tructure created for R □S reduction and the mono tatic R □S value □of the □ perfect electric conductor □PE □ □plate of the □ame dimen ion □are given Fig □□c □how □the R □S reduction of the □ meta urface □tructure created for R □S reduction compared to the PE □ plate □□

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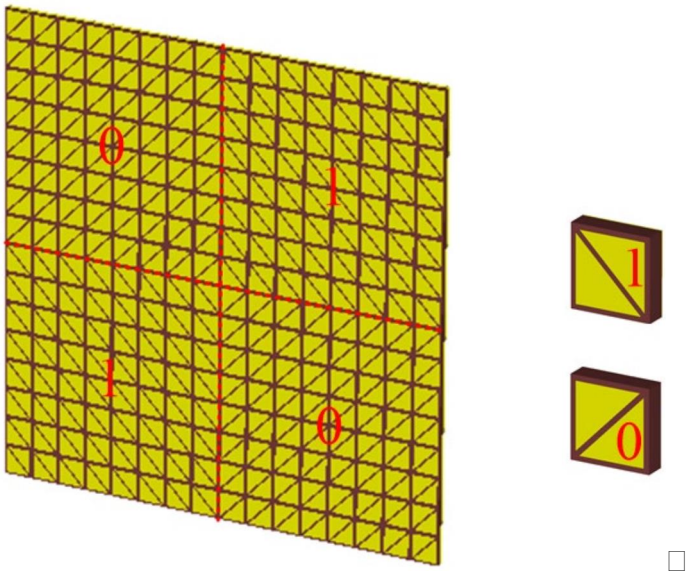

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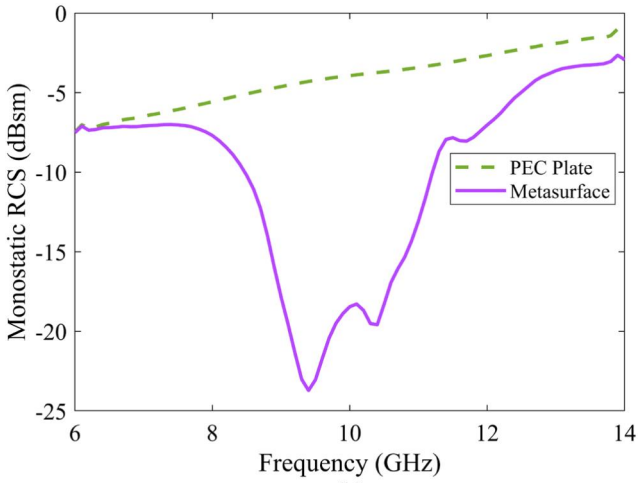
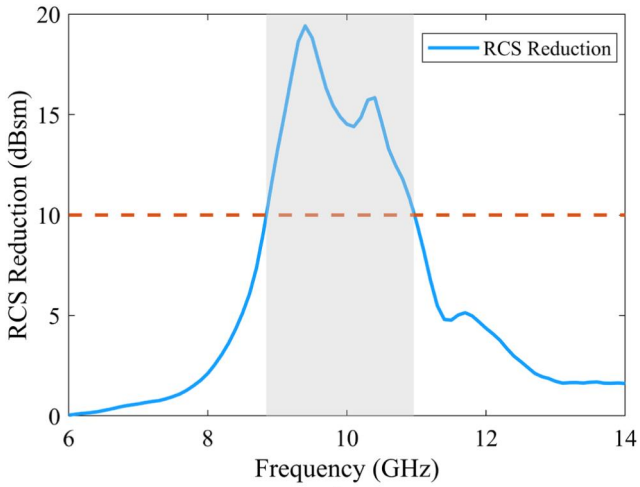


(b) □



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e ign of a low profile meta urface ba ed linear polarization converter and R S reduction u ing thi converter de ign

Fir tl when the imulated mono tatic R S value of the PE plate of the ame ize a the meta urface created for R S reduction in the frequenc range of G z are examined in Fig b it i een that the R S value of the ugge ted meta urface i lower than the PE at ever frequenc Secondl it i noted from Figure c that the R S reduction of the meta urface created for R S reduction i over dB m in the range of G z compared to the PE plate of the ame ize

ON ON

In thi tud a meta urface ba ed LP converter i pre ented that offer over P R in the frequenc range of G z and over P R in the frequenc range of G z in the microwave band The ugge ted de ign i con tructed with FR dielectric material with a thickne of mm which i widel u ed in the market a ub trate material cheap to uppl and ha a low profile In addition a meta urface tructure wa created for R S reduction b u ing the ugge ted LP converter de ign and the R S reduction of thi meta urface compared to the PE plate of the ame ize wa achieved to be over dB m in the range of G z

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Evaluation of Short-Term Traffic Flow Prediction Approaches in Transportation

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Abstract

The implications of recent developments in technology have paved a way for designing high-quality applications in transportation engineering. One problem in dense urban area is the high volume of vehicles travelling on main roads. This requires efficient utilization of road capabilities to allow more secure and confortable travel. Researchers have focused on the development of short-term traffic flow prediction algorithms. This study aims to review the recent proposed prediction approaches to give an insight for potential researchers. The operating principles of the proposed approaches are covered along with their strong and week points. Finally, a potential future work direction is presented.

Keywords: *Transportation engineering, Short-term, Flow, Prediction*

1 INTRODUCTION

Intelligent Transportation Systems (ITS) represent a transformative approach to modernizing and optimizing transportation networks through the integration of advanced information and communication Technologies [1]. These systems are designed to enhance the safety, efficiency, and sustainability of transportation by providing real-time data, facilitating communication between various components of the transportation infrastructure, and improving decision-making processes for both operators and users. ITS concept has its roots in the 1960s and 1970s, with the advent of early traffic management systems and computer-based traffic signal control. In the 1990s, the U.S. Department of Transportation launched a significant initiative to promote the development and deployment of ITS, recognizing its potential to address growing transportation challenges.

ITS encompasses a broad range of applications, including traffic management, public transportation management, emergency response coordination, and vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication systems [2]. These applications are designed to work together to create a more integrated and efficient transportation network. For instance, traffic management systems can use real-time data to optimize traffic signal timings, reduce congestion, and improve traffic flow. Public transit systems can benefit from ITS by providing real-time information to passengers, improving schedule adherence, and increasing overall system reliability. The implementation of ITS has been driven by several factors, including the need to reduce traffic congestion, lower greenhouse gas emissions, and enhance road safety. With the growing availability of data and advancements in machine learning and artificial intelligence, ITS is becoming increasingly sophisticated, enabling predictive analytics and autonomous vehicle technologies to be integrated into transportation systems.

The rapid urbanization and the increasing demand for efficient transportation have led to the exploration of innovative solutions to address traffic congestion, reduce environmental impacts, and enhance the overall user experience [3]. ITSs emerge as a pivotal solution, leveraging the power of technology to revolutionize how transportation networks are managed and utilized. By incorporating a range of technologies, such as sensors, cameras, GPS, and data analytics, ITS enables the collection and analysis of vast amounts of data that can be used to monitor traffic conditions, manage public transit systems, and ensure road safety. In summary, Intelligent Transportation Systems represent a critical advancement in the management and operation of transportation networks. By harnessing the power of technology, ITS can significantly improve the efficiency, safety, and sustainability of transportation, making it an essential component of future urban planning and infrastructure development.

Short-term traffic flow prediction is a critical component of modern traffic management systems, aimed at forecasting traffic conditions over a short period, typically ranging from a few minutes to a couple of hours [4]. Accurate short-term traffic flow prediction is essential for optimizing traffic signal timings, managing congestion,

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enhancing the efficiency of transportation networks, and providing real-time information to travelers. By predicting traffic patterns in the near future, transportation authorities can make informed decisions to alleviate congestion, reduce travel time, and improve overall road safety.

The need for effective traffic flow prediction has grown in response to the increasing urbanization and the corresponding rise in traffic volumes on road networks. Traditional traffic management strategies often relied on historical data and static models, which could not adequately account for the dynamic nature of traffic conditions. This limitation led to the development of short-term traffic flow prediction models that use real-time data to anticipate changes in traffic patterns. Early approaches to short-term traffic flow prediction were based on statistical methods, such as time series analysis, linear regression, and autoregressive integrated moving average (ARIMA) models. These methods aimed to identify patterns in traffic flow data and extrapolate them to predict future traffic conditions. While these techniques provided a foundation for traffic prediction, they often struggled to capture the complexity and non-linearity inherent in traffic dynamics.

With advancements in computational power and the increasing availability of high-quality traffic data, more sophisticated methods have been developed. Machine learning and deep learning algorithms, such as artificial neural networks (ANNs), support vector machines (SVMs), and recurrent neural networks (RNNs), have emerged as powerful tools for short-term traffic flow Prediction [5]. These models can learn complex patterns from large datasets, making them well-suited to handle the variability and unpredictability of traffic flow. Short-term traffic flow prediction models are now being integrated into Intelligent Transportation Systems (ITS), enabling real-time decision-making and dynamic traffic management. These models are also essential for the development of autonomous vehicles, as they provide the predictive capabilities necessary for safe and efficient navigation in complex traffic environments. To sum up, short-term traffic flow prediction is a vital aspect of modern traffic management, driven by the need for real-time, accurate, and actionable insights into traffic conditions. The evolution from simple statistical models to advanced machine learning techniques reflects the growing complexity of traffic systems and the demand for more precise and adaptable prediction tools. This paper seeks to summarize recent advancements in short-term traffic flow prediction, emphasizing the progress achieved in this field.

2 FUNDAMENTALS OF SHORT-TERM TRAFFIC FLOW PREDICTION APPROACHES

Short-term traffic flow prediction is an essential aspect of traffic management, aimed at forecasting traffic conditions over a brief time horizon, typically ranging from a few minutes to a couple of hours. The fundamental principle behind these approaches involves dividing time into discrete slots and predicting traffic flow for each slot based on various data sources and predictive models. The time slot-based approach enables the modeling of dynamic traffic patterns by capturing the temporal variations in traffic flow, which are influenced by factors such as time of day, weather conditions, and traffic incidents. As a result, short-term traffic flow prediction approaches that divide time into slots are fundamental to modern traffic management systems. By leveraging a combination of data collection, preprocessing, and advanced predictive modeling techniques, these approaches provide real-time insights into traffic conditions, enabling more effective traffic management and improved road safety. As technology continues to advance, the accuracy and reliability of these predictions are expected to improve, making them an indispensable tool for transportation planners and operators.

2.1 Time Slot Division

The division of time into slots is a crucial step in short-term traffic flow prediction. These time slots, often ranging from a few seconds to several minutes, serve as the fundamental units for analysis. The selection of an appropriate time slot length depends on the specific application and the required prediction accuracy. Shorter time slots provide more granular predictions but require more data and computational resources, while longer time slots may smooth out short-term fluctuations, leading to less precise predictions. For instance, in urban traffic management systems, time slots of 5 to 15 minutes are commonly used to capture the variability in traffic flow during peak hours and to respond to sudden changes such as accidents or road closures. The choice of time slot length directly impacts the performance of prediction models, as it determines the resolution of the forecast and the ability to capture rapid changes in traffic conditions.

2.2 Data Collection and Preprocessing

Accurate short-term traffic flow prediction relies heavily on the quality and quantity of data collected. Various data sources are utilized, including loop detectors, cameras, GPS devices, mobile phones, and connected vehicles. These sources provide real-time information on traffic volume, vehicle speed, occupancy rates, and other relevant

parameters. The collected data is then preprocessed to remove noise, fill in missing values, and normalize the data for further analysis. Preprocessing steps often include outlier detection, data smoothing, and feature extraction. These steps are essential to ensure that the data accurately reflects the current traffic conditions and is suitable for input into prediction models. Additionally, historical traffic data is often combined with real-time data to improve the accuracy of predictions by capturing long-term patterns and trends.

2.3 Predictive Modeling Approaches

Once the data is preprocessed and time is divided into slots, various predictive modeling approaches are employed to forecast traffic flow for each time slot. Traditional statistical methods, such as autoregressive integrated moving average (ARIMA) models, have been widely used in early traffic flow prediction systems. These models predict future traffic flow by identifying patterns in historical data and extrapolating them into the future. However, the non-linear and complex nature of traffic flow has led to the adoption of more sophisticated machine learning and deep learning techniques. Machine learning models, such as support vector machines (SVMs), decision trees, and k-nearest neighbors (k-NN), can capture non-linear relationships between input variables and traffic flow. These models are trained on historical data and can make real-time predictions based on the input features.

Deep learning models, particularly recurrent neural networks (RNNs) and long short-term memory (LSTM) networks, have shown great promise in short-term traffic flow prediction. These models are capable of learning from sequential data and capturing temporal dependencies between time slots. LSTM networks, for example, are well-suited for traffic flow prediction because they can retain information over longer time periods, making them effective at predicting traffic patterns in highly dynamic environments.

2.4 Model Evaluation and Adaptation

After developing a prediction model, its performance is evaluated using various metrics such as mean absolute error (MAE), root mean square error (RMSE), and mean absolute percentage error (MAPE). These metrics help in assessing the accuracy and reliability of the predictions. Model evaluation is often conducted using cross-validation techniques to ensure that the model generalizes well to unseen data. To maintain accuracy, predictive models are regularly updated and adapted to reflect changes in traffic patterns. This is particularly important in urban environments where traffic conditions can change rapidly due to construction, road closures, or changes in public transportation schedules. Adaptive models that can learn from new data in real-time are crucial for maintaining the relevance and accuracy of short-term traffic flow predictions.

3 OVERVIEW OF RECENT PREDICTION APPROACHES

A novel approach is presented for improving short-term traffic flow predictions, critical for effective traffic management [6]. The authors introduce the CMPGM model, which integrates partial differential equations with a control matrix to better capture the spatiotemporal dynamics of traffic data. The CMPGM model is designed to handle the inherent uncertainties and small sample sizes commonly encountered in traffic data. By introducing a control matrix into the partial grey model, the authors enhance the model's ability to capture the underlying dynamics of traffic flow, leading to more accurate and stable predictions. The model’s effectiveness is validated through extensive experiments, where it is compared with several existing models, including traditional statistical methods, machine learning approaches, and deep learning techniques. The results demonstrate that the CMPGM model outperforms these alternatives, particularly in terms of mean squared error (MSE), mean absolute percentage error (MAPE), and root mean square percentage error (RMSPE).

An innovative model aimed at improving the precision of short-term traffic flow predictions, a critical component for effective traffic management in ITS [7]. The proposed model, named the Spatio-Temporal Residual Graph Convolutional Network (STRGCN), combines two powerful techniques: the Deep Full Residual Graph Convolutional Network (DFRGCN) for capturing spatial correlations in traffic networks, and the Bidirectional Gated Recurrent Unit (Bi-GRU) enhanced with an attention mechanism to accurately model temporal dependencies. This dual approach allows the STRGCN model to better understand and predict the complex and dynamic relationships in traffic data. The model was tested on multiple publicly available traffic datasets, where it consistently outperformed existing prediction models, demonstrating significant improvements in both accuracy and stability. The research underscores the model's ability to handle the intricate spatio-temporal interactions inherent in traffic systems, making it a valuable tool for real-time traffic flow prediction. By effectively addressing the challenges of traditional models, STRGCN has the potential to enhance decision-making processes in ITS, leading to more efficient traffic management and reduced congestion in urban environments.

A sophisticated approach is introduced to address the challenges of predicting long-term traffic flow in complex urban environments [8]. Given the unpredictable nature of urban traffic, influenced by factors like weather, holidays, and nearby traffic conditions, traditional models often struggle to maintain accuracy over extended periods. The proposed hybrid model leverages the strength of Convolutional Neural Networks (CNNs) in extracting meaningful features from traffic data while utilizing Bidirectional Long Short-Term Memory (BiLSTM) networks to capture and learn from temporal dependencies in both forward and backward directions. This dual approach allows the model to effectively handle the intricacies of traffic patterns over time. The authors validate their model using data from four major roadways in Madrid, comparing its performance against eight widely-used baseline models. The results clearly show that the CNN-BiLSTM hybrid model achieves superior accuracy, as evidenced by improved mean absolute error (MAE), root mean square error (RMSE), and classification accuracy. The model not only excels in forecasting traffic flow up to 72 hours in advance but also adapts well to the varying conditions of different urban roads. The study emphasizes the practical implications of these findings, suggesting that the model could be a valuable tool for urban planners and traffic management systems, helping to alleviate congestion and optimize traffic flow through better-informed decision-making.

An advanced methodology is proposed for short-term traffic flow prediction by combining the strengths of the K-Nearest Neighbor (KNN) algorithm and the Bidirectional Long Short-Term Memory (BiLSTM) network [9]. This hybrid approach effectively captures both the spatial and temporal dynamics of traffic data, addressing a critical gap in previous models that largely neglected spatial correlations in traffic flow. The KNN algorithm is utilized to identify and select relevant spatial data points with high correlation, which are then used as input for the BiLSTM model to predict traffic flow. The BiLSTM model, with its ability to process information in both forward and backward directions, further enhances the prediction accuracy by capturing long-term dependencies in the data. The study is validated using real-time traffic data from high-speed roads in the United Kingdom, showcasing the model's superior performance compared to traditional models like Support Vector Regression (SVR), standard LSTM, GRU, and CNN-LSTM. The KNN-BiLSTM model demonstrated significant improvements in mean absolute error (MAE), root mean square error (RMSE), and mean absolute percentage error (MAPE), with performance enhancements of up to 77% in some cases. The results highlight the practical applicability of this model in real-world traffic management systems, where accurate short-term predictions are crucial for optimizing traffic flow, reducing congestion, and improving overall transportation efficiency. The research contributes valuable insights into the development of more robust and accurate traffic prediction models, paving the way for more intelligent and adaptive traffic management solutions.

An approach aims to improve the accuracy and efficiency of short-term traffic flow predictions, particularly in large-scale traffic networks with numerous sensors [10]. The proposed Spatio-Temporal Shared Gated Recurrent Unit (STSGRU) model leverages a shared weight mechanism that allows for simultaneous many-to-many predictions across different sensors, significantly reducing the computational resources and time required for large-scale predictions. By avoiding the need to map traffic networks to images or complex graph structures, the model simplifies the prediction process while maintaining high accuracy. Additionally, the authors incorporate a weekly pattern module based on Fourier transform to capture the inherent periodicity in traffic flow. This module helps to smooth out data fluctuations and provides more stable inputs to the prediction model, enhancing its ability to forecast traffic trends over multiple time steps. The model's effectiveness is validated through extensive experiments on several real-world traffic datasets, including the Caltrans Performance Measurement System (PeMS). The results show that the STSGRU model not only achieves prediction accuracy comparable to that of more complex graph neural networks but also offers greater flexibility and efficiency, making it particularly suitable for deployment in ITS. This research marks a significant advancement in traffic flow prediction, offering a scalable, efficient, and highly accurate solution for managing traffic in large urban areas.

A comprehensive approach is designed to improve the accuracy and reliability of short-term traffic flow predictions, which are critical for effective traffic management and congestion mitigation [11]. The authors propose a hybrid model that combines Variational Mode Decomposition (VMD) and an Improved Dung Beetle Optimization (IDBO) algorithm to enhance the performance of a Long Short-Term Memory (LSTM) network. VMD is employed to decompose the raw traffic data into several intrinsic modal components, effectively isolating the complex and nonlinear aspects of traffic flow from the noise. This decomposition allows for a more precise and focused prediction process. The IDBO algorithm, which integrates chaos mapping, a variable spiral search strate□□□and □e□□ □i□ht□is then □sed to optimi□e the □□TM model parameters□□□rther impro□in□the model's ability to handle the intricacies of traffic data. The combination of these methods results in a highly accurate and stable prediction model. The model was tested on real-world traffic data from California's interstate highways, where it demonstrated superior performance compared to other methods, such as traditional LSTM, EMD-LSTM, and VMD-LSTM models. The VMD-IDBO-LSTM model showed significant reductions in mean absolute error

(MAE), mean absolute percentage error (MAPE), and root mean square error (RMSE), indicating its effectiveness in addressing the challenges of nonlinearity and data noise.

A comprehensive methodology is introduced for enhancing the accuracy and efficiency of short-term traffic flow predictions, a key aspect of modern intelligent transportation systems [12]. The authors propose an ensemble model that synergistically combines optimized Variational Mode Decomposition (VMD) with a Long Short-Term Memory (LSTM) network and its bidirectional variant (BILSTM). The innovative use of an improved Bat Algorithm optimizes the VMD parameters, ensuring that the traffic flow data is decomposed into more stable intrinsic mode functions (IMFs). This preprocessing step significantly improves the predictive capabilities of the LSTM and BILSTM models by providing cleaner, more stable data inputs. The empirical validation of the model using real-world traffic data from Changsha City showcases its superior performance compared to conventional models. Specifically, the ensemble approach demonstrates marked improvements in prediction accuracy, as measured by metrics such as mean absolute error (MAE) and root mean square error (RMSE). The study also includes a detailed comparative analysis and ablation experiments, underscoring the effectiveness of each component of the ensemble model. The findings suggest that this integrated approach can substantially enhance short-term traffic flow predictions, offering valuable insights for traffic management systems aiming to reduce congestion and improve urban mobility. Additionally, the research highlights the potential of ensemble machine learning methods to address the complexities and non-linearities inherent in traffic data, paving the way for more robust and adaptive predictive models in transportation engineering.

An innovative hybrid approach is suggested that integrates the strengths of the Autoregressive Integrated Moving Average (ARIMA) model and Long Short-Term Memory (LSTM) neural networks to improve the precision of short-term traffic flow predictions [13]. ARIMA is utilized to effectively capture the linear, stochastic patterns inherent in traffic data, while LSTM networks are employed to model the more complex, nonlinear temporal dependencies. By dynamically weighting the predictions from both models, the proposed method ensures that the final output reflects the most accurate aspects of each approach. The research highlights the flexibility and robustness of the combined model, particularly in handling diverse traffic conditions across different highways. The model was rigorously tested on real-world traffic datasets from three major highways (AL215, AL2206, and AL2292), where it consistently outperformed standalone models like ARIMA and LSTM, as well as an equal-weight combination method. The evaluation metrics, including mean absolute error (MAE), mean squared error (MSE), root mean square error (RMSE), and mean absolute percentage error (MAPE), all indicated superior performance by the hybrid model.

4 CONCLUSION

In conclusion, this paper provides a comprehensive review and evaluation of recent advancements in short-term traffic flow prediction approaches, which are crucial for optimizing traffic management systems in increasingly congested urban environments. By analyzing a variety of methodologies, including statistical models, machine learning techniques, and hybrid approaches, the study highlights the strengths and limitations of each method in handling the complex and dynamic nature of traffic flow. The findings suggest that while traditional methods like ARIMA have their merits in capturing linear patterns, more sophisticated models such as LSTM and hybrid models offer superior performance by effectively addressing non-linear and temporal dependencies in traffic data. The paper emphasizes the importance of integrating advanced data processing and predictive modeling techniques to enhance the accuracy and reliability of short-term traffic predictions, thereby contributing to more efficient and responsive traffic management systems. Future research should continue to explore the potential of emerging technologies and innovative approaches to further improve the prediction accuracy and applicability in real-world traffic scenarios.

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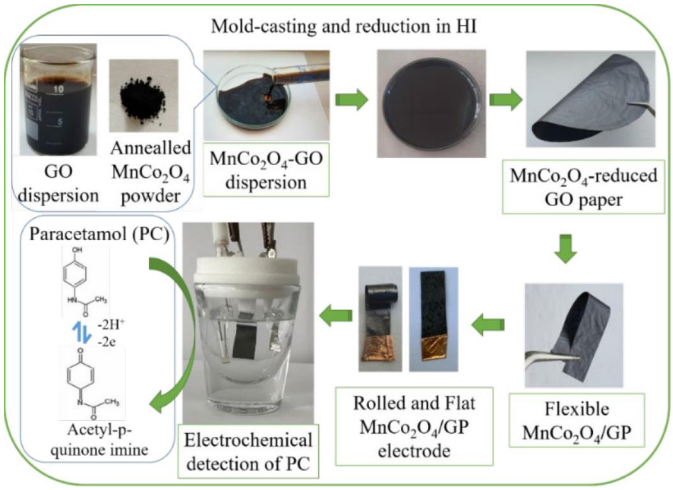

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NTRO T ON

sp altite is a drocarbo rock of petrole m origi sp alt materials are formed b settli g i cracks a d voids d dergro d d e to factors s c as press re temperat re a d time sp altites ave almost t e same properties as coal i appeara ce a d c emicall a d bot are sed as e erg ra materials T e formatio of asp altites is petrole m based ile t e formatio of coals is orga ic pla t resid es etc] W ile t e amo t of ox ge i asp altic materials especiall asp altic p robit me is aro d t is rate varies bet ee a d i differe t t pes of coal

Şırnak province, one of the most border provinces of the Southeastern Anatolia Region of Turkey] is t e so rce of asp altites a importa t e erg ra material Asphaltite deposits in the Şırnak region are located in phylons. T ese are Silopi Harb l Silopi Silip Silopi Üçkardeşler, Avgamasya, Milli, Segürük, Nivekara, Karatepe, Seridahli, İspindoruk, Rutkekurat a d Ul dere Ortas p lo s According to the asphaltite license data of TKİ in 2018; there is a total reserve of approximately 67,500,000 tons in Şırnak Merkez a d Silopi T e total reserve is reported as to s accordi g to t e data of MT] emical a al zes of asp altites ge erall s o approximatel moist re co te t as co te t s lf r ratio is a d its calorific val e is bet ee kcal o sideri g t e ig calorific val e of asp altite it is s itable for se as a e erg ra material i t ermal po er pla ts for electricit prod ctio a d i d strial areas T e as s lf r emissio rate ca be red ced b avi g circ lati g fl idized beds a d si g limesto e i t ermal po er pla ts sp altite is sed as a e erg ra material i t e x MW t ermal po er plant located in Şırnak Silopi] Hig as a d s lf r ratios also ca se e viro me tal poll tio sp altites it ig as ratios ca be clea ed b appl i g coal preparatio a d e ric me t met ods a d ca be t r ed i to ig er q alit ig er calorie e erg ra materials For t is reaso t e e erg so rce i sig ifica t ig reserves s o ld be clea ed a d eval ated it e ric me t met ods b taki g e viro me tal co ditio s i to co sideratio O t e ot er a d a i crease i t e amo t of ver fi e grai ed asp altite is observed d ri g t e applicatio of asp altite prod ctio met ods sp altite sample is give i Fig re



□i□□re□□□□ sp□altite sample□

Most of t□ese fi□e sized asp□altites are t□ro□□a□a□□□it□o t□bei□g□sed a□d ca□□ot be eval□ated eco□omicall□□□ a□d t□e□ca□se□e□viro□me□tal poll□tio□□□□ll met□ods□sed i□clea□i□g coals ca□also be applied□o□asp□altites□□ O□e of t□ese met□ods is t□e oil agglomeratio□met□od□I□t□is st□d□t□e oil agglomeratio□e□ric□me□t met□od□as applied□□it□differe□t oil t□pes□o□t□e asp□altite sample take□from t□e□□vgamas a□mi□e site operati□g□□it i□t□e borders of Şırnak province, and the□□ ash ratios□ere reduced and higher q□alit□asp□altite□□as□btai□ed□□

Oil□agglomeratio□□□sp□erical agglomeratio□□□as i□flotatio□□□is a met□od of e□ric□me□t t□at ca□make selective□ separatio□b□taki□g adva□tage of t□e differe□ces i□t□e s□rface properties of coal a□d t□e accompa□□i□g mi□eral□ s□bsta□ces□□oal is□at□rall□more□□drop□obic t□a□t□e accompa□□i□g i□orga□ic s□bsta□ces□W□e oil is added□ to t□e s□spe□sio□of po□dered coal i□□ater a□d mixed t□e□□□drop□obic coal particles are coated□□it□a t□i□la□er□ of oil□□□□□□□]□□s a res□lt of mixi□g t□e oil coated coal particles collide a□d form agglomerates b□ ad□eri□g to□ eac□ ot□er□□it□t□e bi□di□g effect of t□e oil□o□t□eir s□rfaces□H□drop□ilic mi□eral□s□bsta□ces□o□t□e ot□er□a□d□□ remai□i□s□spe□sio□i□a dispersed state□□gglomerates resista□t to dispersio□are removed from t□e s□spe□sio□□ b□a mec□a□ical met□od□sievi□g□□□□□□□]□H□drop□obic coal particles are□□etted□□it□oil b□t□□□drop□ilic cla□□ particles a□d ot□er resid□es are□ot□T□e coal particles are t□e□collected i□to particles large□o□g□to be separated□□ separated from t□e resid□es b□a sieve□□

□ □ □T□R□□□□N□□ □T□O□□

The asphaltite sample used in the experiments applied in this study□as taken from Şırnak□□vgamas a asp□altite□ field□T□e experime□tal flo□ diagram is s□o□□i□t□e Fig□re□□□Experime□tal co□ditio□s□□it□f□el oil s□□flo□er□ oil□kerose□e are s□o□□i□□Table□□a□d Fig□re□□s□o□s t□e agglomeratio□prod□ct□□

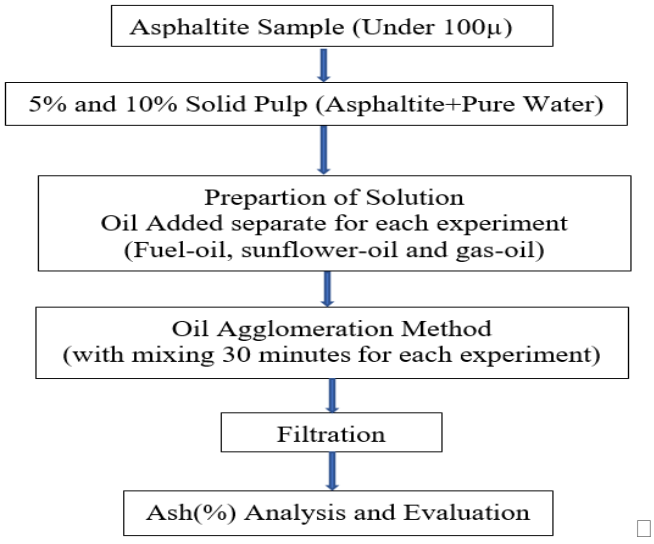

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Table □□□Experime□tal□co□ditio□s□□it□f□el oil□s□□flo□er oil□

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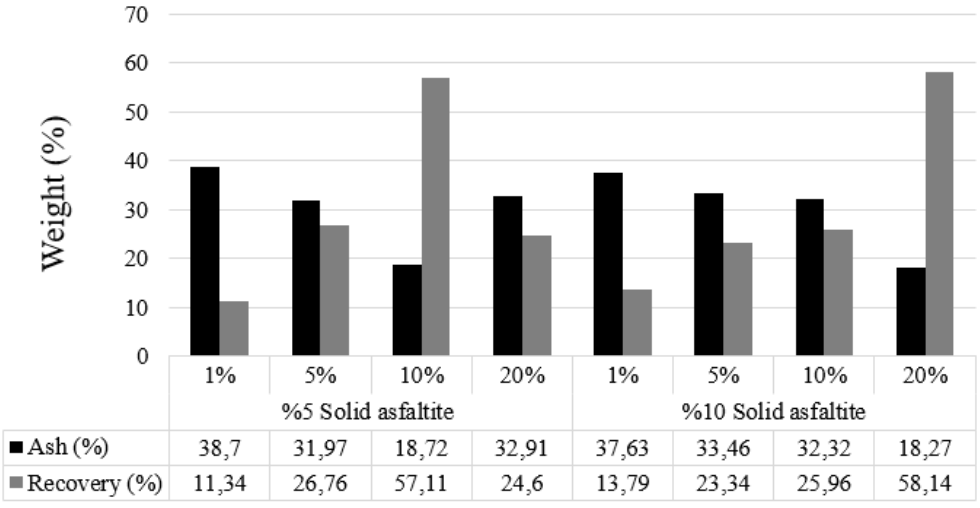

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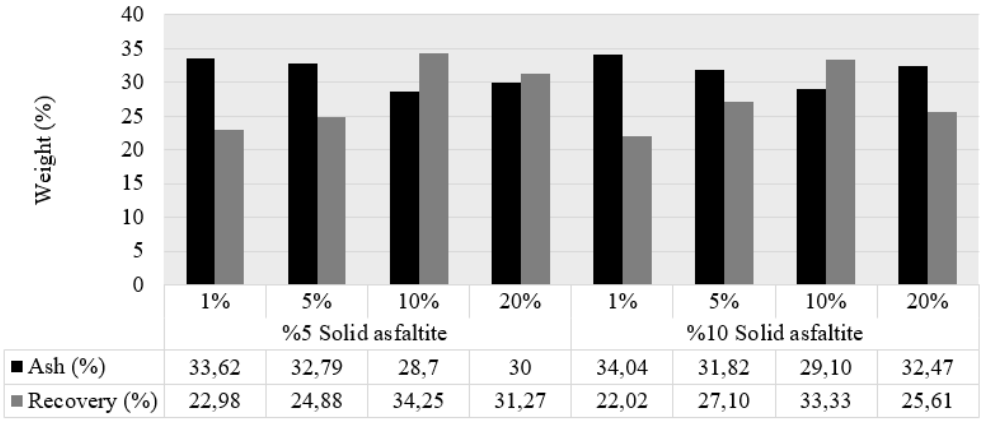

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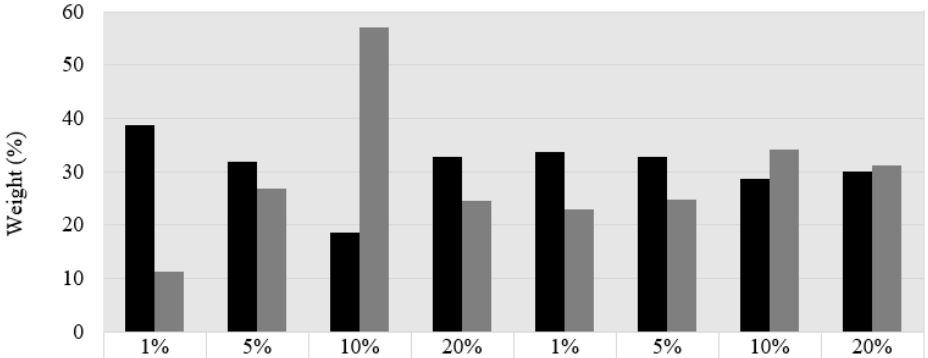

■ Ash (%)	38,7	31,97	18,72	32,91	33,62	32,79	28,7	30,00
■ Recovery (%)	11,34	26,76	57,11	24,6	22,98	24,88	34,25	31,27

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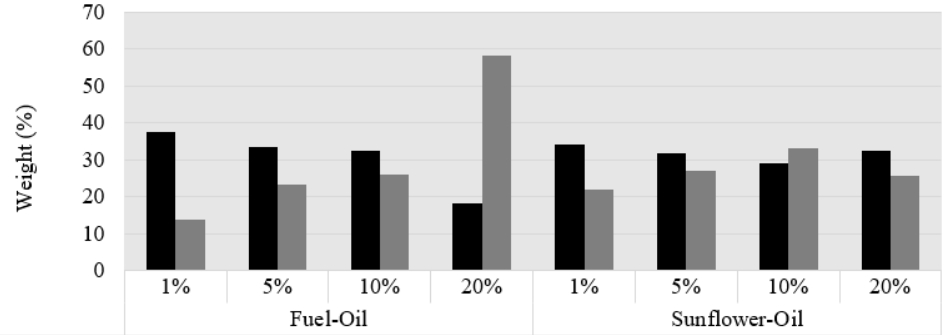

■ Ash (%)	37,63	33,46	32,32	18,27	34,04	31,82	29,1	32,47
■ Recovery (%)	13,79	23,34	25,96	58,14	22,02	27,1	33,33	25,61

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I rece t ears h droge productio usi g the h droge evolutio reactio ER has bee studied quite freque tl amo g clea e erg sources ER reactio is highl preferred because it offers high e erg de sit a d has zero polluta t emissio s Productio of h droge via the electrochemicall ER reactio is both eco omical a d ca be easil impleme ted u der ambie t co ditio s Limited qua tities a d high costs of metal based electrocatal sts such as Pt limit the use of these catal sts for ER Therefore it is crucial to develop relativel low cost a d durable electrocatal sts I this stud u i O a d reduced graphe e oxide rGO a ocomposites were s thesized o the ickel foam electrode surface usi g the o e pot electrochemical co depositio method The surfaces of the obtai ed a ocomposites were decorated with MoO a oparticles b electrochemical depositio at a co sta t pote tial The high electrocatal tic properties of the s thesized modified electrodes for the ER reactio were i vestigated usi g li ear sca i g voltammetr

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ir pollutio due to the emissio of carbo products b the combustio of fossil fuels proves a major e viro me tal threat lthough h dropower solar a d wi d are some of the alter ative re ewable e erg resources et the possess low e erg co versio efficie c We eed strategies to store a d tra sport e erg resources such as chemical fuels O e of the promisi g ca didates i this regard is h droge due to its highest value of gravimetric e erg de sit of MJ kg amo g all the chemical fuels] droge as a fuel does ot emit carbo co tai i g polluta ts like O O etc like other fossil fuels therefore it is a e viro me t frie dl fuel]

droge evolutio reactio ER is the simplest electrocatal tic reactio With developme t of re ewable e erg sources electrol tic productio of h droge becomes a alter ative wa of h droge productio for i ter al combustio e gi es a d fuel cells I particular the h droge evolutio reactio ER occurred o cathode i electrol tic bath provides pure gas ut this reactio ge erall depe ds o the co siderable electrocatal sts due to the high overpote tial eeded i the process] The utilizatio of electrocatal sts could accelerate the reactio ki etics a d lower e erg barrier of water dissociatio thereb decreasi g the overpote tial ER proceeds through the Volmer e rovsk a d Tafel reactio mecha ism ER i volves h droge adsorptio at the electrode surface a d as the adsorptio e erg depe ds o the ature of electrode materials used so does the ki etics of ER] Noble metal based materials such as Pt a d RuO are the most effective ER electrocatal sts owever their practical applicatio s are mai l hi dered b the scarcit i stabilit a d high costs] So the developme t of ew a d efficie t electrocatal st desig strategies to improve the electrocatal tic activit a d stabilit of existi g materials is a urge t problem to be solved arbo based materials have received widespread atte tio due to their u ique adva tages for desig ated catal sis such as tu able molecular structures exotic electro ic properties as well as stro g tolera ce to acid alkali e e viro me ts

I L N O

Firstl u i O rGO a ostructures were prepared o the Ni foam electrode surface u i O rGO was produced i a three electrode cell s stem usi g electrochemical tech iques u der a co sta t pote tial of mV for mi utes The electrode was thermall a ealed at for hours to form the oxide

□□droge□evolutio□reactio□o□MoO□decorated□□u□i□O□reduced□graphe□e□oxide I□ENSTE□ □□□□
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To□decorate□the□□u□i□O□rGO□surface□with□MoO□□□□□mM□□□l□solutio□□co□tai□i□g□□□□mM□MoO□□was□chose□□as□the□electrol□te□□□□□c□cli□g□voltammograms□from□□V□to□□□V□□MoO□□was□allowed□to□come□to□the□surface□electrochemicall□for□□□□c□cles□□The□prepared□MoO□□□□u□i□O□rGO□electrodes□were□characterized□b□tech□iques□such□as□□R□□□□PS□□SEM□□a□d□E□S□□Li□ear□sweep□voltammograms□of□as□fabricated□MoO□□□□u□i□O□rGO□electrodes□i□□□□□□M□□O□□electrol□te□were□recorded□for□the□□ER□applicatio□□□

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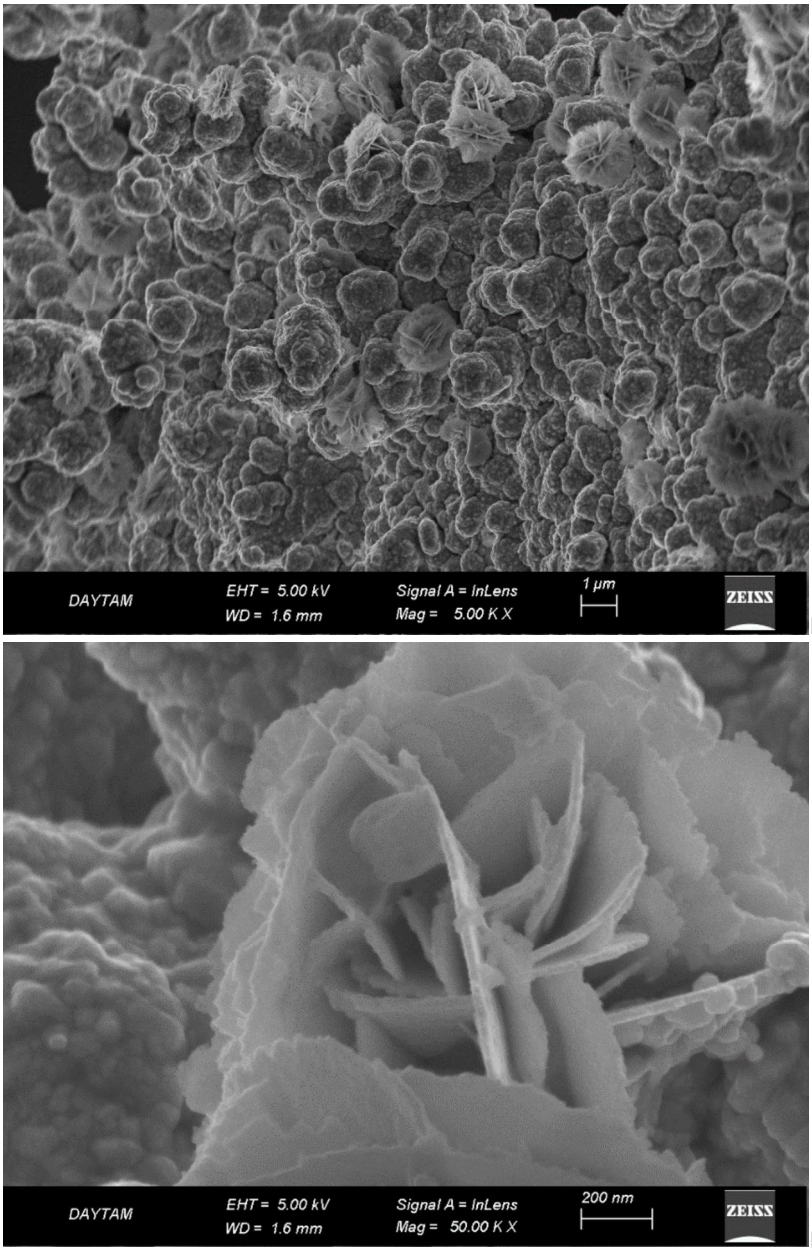

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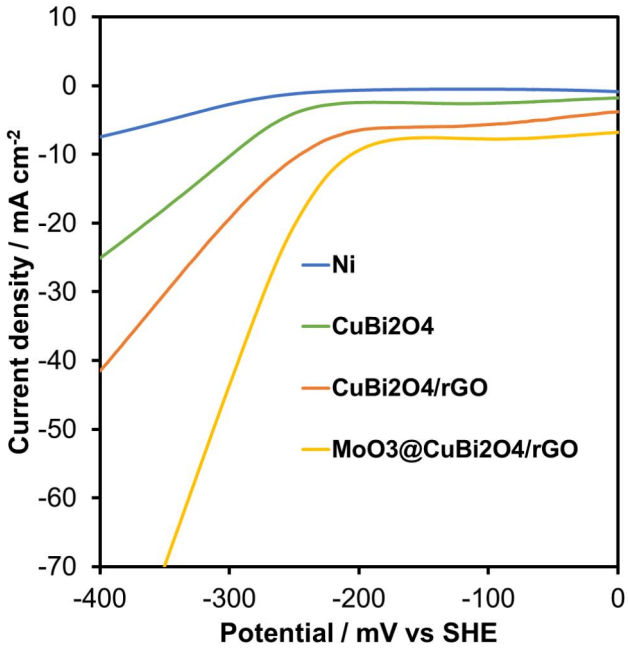

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International Conference on Engineering Natural Sciences and Technological Developments ICENSTED

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The stud of flow and heat characteristics over an ellipse in an in duct flow involves anal zing the behavior of fluid and heat transfer around an elliptical object placed within a duct This anal sis is important for various engineering applications including heat exchangers aerod namic design and fluid machiner In this stud the flow and heat transfer characteristics in a m long channel were examined over the ellipse placed inside the channel In the in channel flow the focus is on cooling the ellipse b giving air and water flow over the ellipse The anal zes were anal zed using NS S Fluent The inlet temperature of air and water was taken as K and the temperature above the aluminum ellipse was taken as K The inlet velocities of air and water were taken as m s m s and m s for flow anal ses respectivel SST k omega a turbulence model suitable for heat transfer and flow characteristics was selected in the anal ses s a result temperature distribution velocit distribution contours and streamlines on the ellipse were obtained for Re nolds numbers and Nusselt numbers at different speeds for the cooling process with the effect of air and water coming on the ellipse

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Stud ing flow and heat characteristics over an ellipse in an in duct flow involves considering both fluid d namics and heat transfer principles Fluid D namics anal ze how the fluid flows around and over the ellipse This includes understanding boundar la er development separation points and vortex shedding Velocit profiles determine how the velocit varies over the surface of the ellipse and in the surrounding flow field This could involve experimental measurements or computational fluid d namics FD simulations Pressure distribution investigate how pressure varies over the surface of the ellipse and its surroundings This can provide insights into lift and drag forces acting on the ellipse Heat transfer characteristics convection evaluate how heat is transferred from the surface of the ellipse to the surrounding fluid through convection This depends on factors such as velocit gradients fluid properties and surface temperature Temperature distribution examine how temperature varies over the surface of the ellipse and in the surrounding fluid This includes understanding thermal boundar la ers and how the interact with the flow field Nusselt Number calculate the Nusselt number to quantif the heat transfer coefficient and compare it with theoretical predictions or empirical correlations oundar onditions Specif boundar conditions for the flow and heat transfer problem This includes inlet velocit temperature and pressure conditions as well as an wall boundar conditions for the surface of the ellipse Modeling approach decide on the modeling approach whether it s anal tical numerical such as finite element anal sis or FD or experimental using wind tunnel tests or other methods hoose appropriate simplifications or assumptions based on the specific problem and desired level of detail Validation and anal sis validate our model or experimental setup against known solutions or experimental data if available nal ze the results to draw conclusions about the flow and heat transfer characteristics over the ellipse This ma involve sensitivit anal ses parametric studies or comparisons with other geometries or flow conditions Overall stud ing flow and heat characteristics over an ellipse in an in duct flow requires a multidisciplinar approach integrating fluid d namics heat transfer and possibl other fields like numerical methods or experimental techniques Modekurti in In his master s thesis he performed FD anal sis for non Newtonian fluids through ellipticall bent ducts] Kabus and Oshio in The investigated experimentall and theoreticall the thermal performance of a pipe arra heat collector] Ekiciler et al the used computational fluid d namics for nanofluidized SiO in back stepped slotted in channel flow solving the conservation equations heat and flow characteristics were tested for different Re nolds numbers] Riaz et al also investigated electro osmotic and thermal effects in a ciliar biased flow model of a viscous fluid connected to an exterior batter passing through an elliptical channel] In their stud in Ragueb and Mansouri obtained the solution of a laminar forced flow of nanofluid in a flow flowing through an elliptical channel] Ibrahim and lturaihi also numericall investigated the properties of thermal flow over pipe banks The investigated the effect of two phase flow in water air with man different

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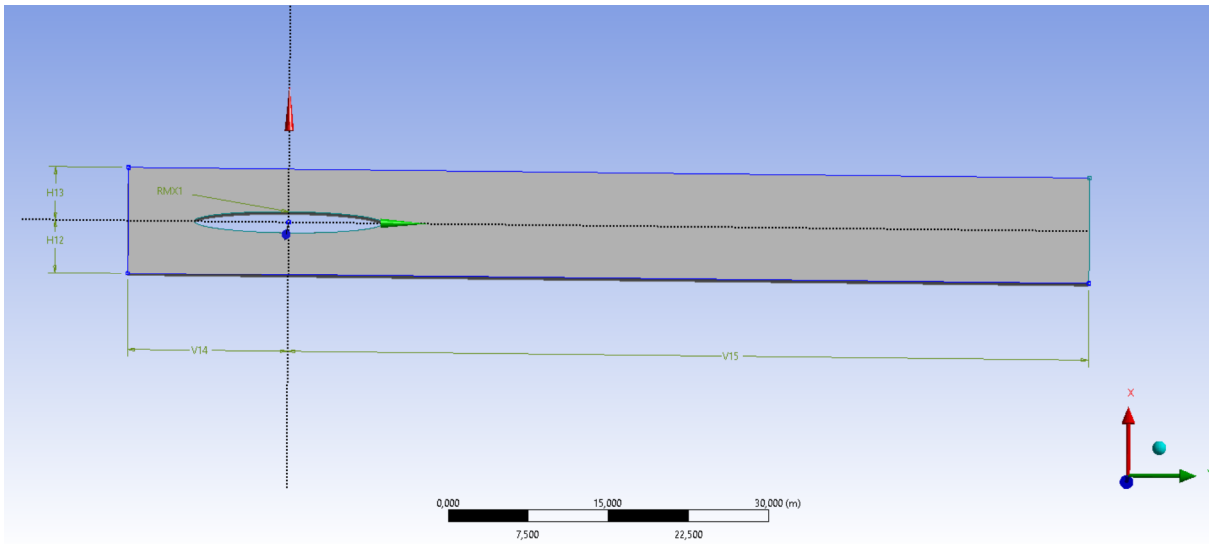
t□pes of vortex generators □□] □In their □□□□□ stud □□Tang □□ang and □hen investigated incompressible Newtonian □□ full □□developed □stead □state laminar flow in □different t□pes of channels □equilateral triangular □rectangular □□ elliptical and super elliptical channels □□] □□heng et al □□□□□ also numericall□ anal□zed the improvement of cooling □ performance of channel cooling in v shaped slots for different concepts of slots □□□] □In their □□□□□ stud □of Du et □ al □□the realizeble k epsilon turbulence model was used to stud□ the flow and heat characteristics in the channel □□ Numerical anal□ses were performed b□ changing the transverse and longitudinal geometries of the flow in a □ rotating rectangular channel changing the Re nolds number to □□□□□ and the rotation number between □□ and □□□] □□ In their stud□ in □□□□□ Singh and Singh performed three dimensional flow anal□ses of the thermal and h□draulic □ performance of a non uniform square wave profile solar air heater with □□NS□S□F□□ENT □□□□□□□□] □In this stud□ □□ the characteristics of heat and flow through an elliptical duct in in channel flow are investigated □□

□ □ □T□R□□ □□N□ □□ □T□O□□

In the problem solution □□NS□S□F□□ENT □□□□□ version was used □For the problem solution □an elliptical c□linder □ with a diameter of □□m is placed in the heat exchanger channel and air and water are given to cool it at different □ fluid □velocities □□



□i□□re □□□Problem geometr□in □□NS□S□F□□ENT □□□□□□

The channel was given □□m up and □□m down b□ selecting the ellipse origin on both sides s□mmetricall□ from the □ centre □□ full □h□drothermal and h□drod□namicall□ developed flow was selected b□ choosing □□□m on the □□□side □ and □□□m on the □□□side from the channel ellipse origin □The length of the ellipse was chosen to be s□mmetrical □ on both sides □□□m □□

Dimensions: 5	
H12	5 m
H13	5 m
RMX1	1 m
V14	15 m
V15	75 m

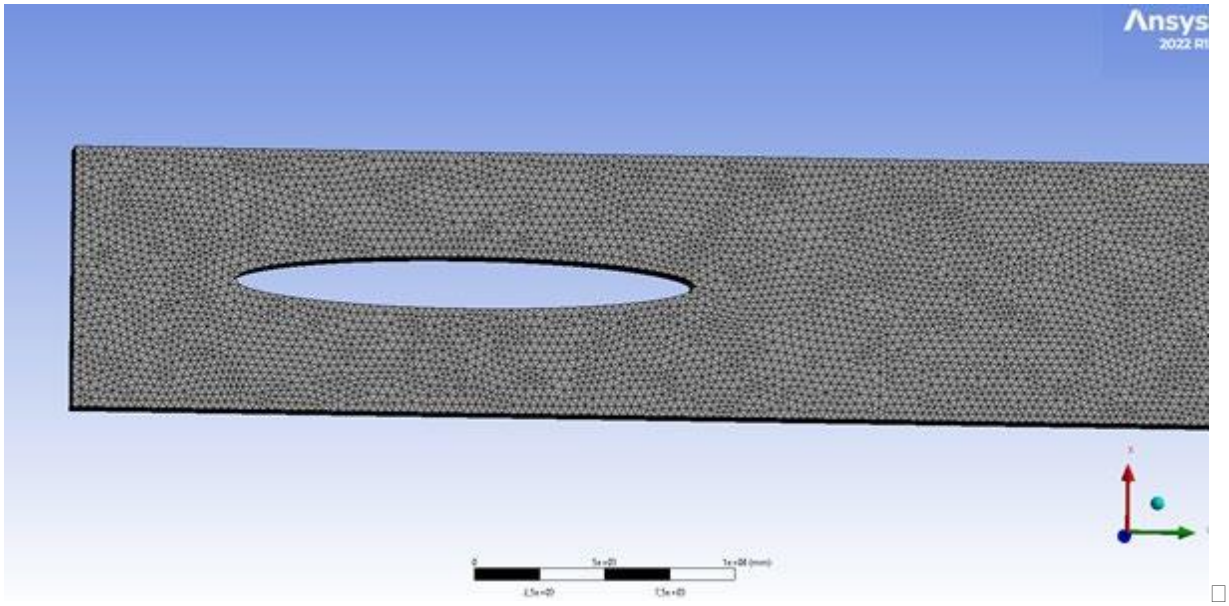
□i□□re □□□Details of geometr□ellipse in duct flow □

The governing equations of incompressible fluid flow can be written as follows □□

□

□ □ □□□□□□□□

here u v and w are velocities of fluid in x and z directions and v are thermal expansion coefficient and kinematic viscosit SST k w model is used for the solution of turbulent flow t the inlet uniform velocit profile has been imposed No slip boundar condition has been implemented i e u v w over the channel wall



i re Meshing form for in channel ellipse

The following Fig shows the frequent mesh image and Fig shows the number of meshes respectivel

Statistics	
Nodes	207815
Elements	646904

i re The number of meshes for in channel ellipse

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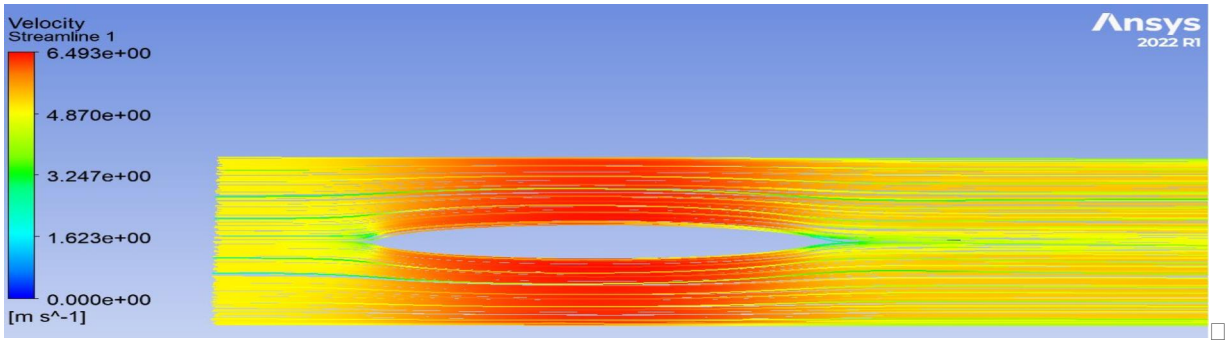
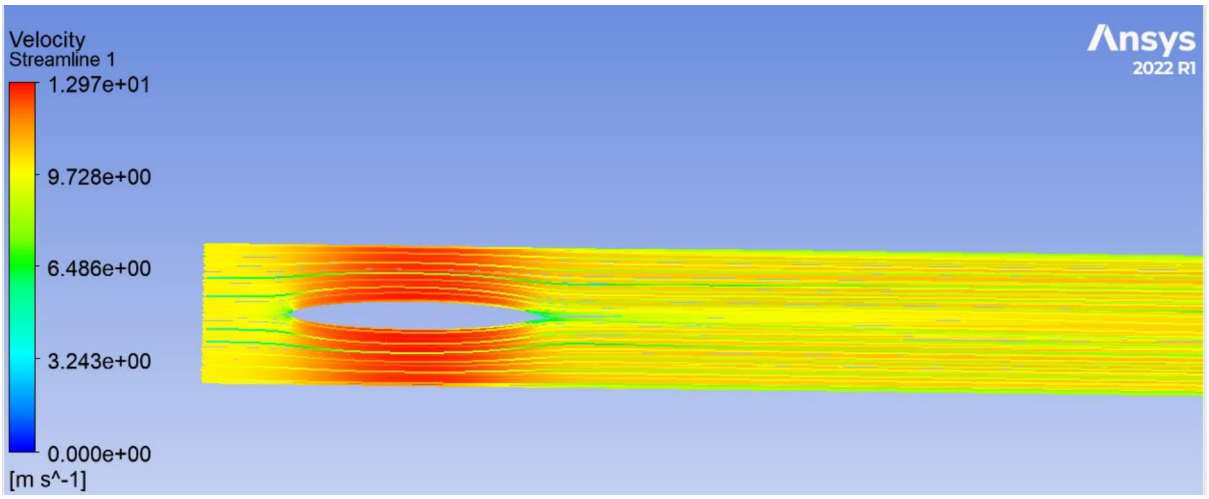
Firstl the cooling of the ellipse in the channel at low speed and the velocit distribution were numericall tested fterwards the speed was graduall increased and the velocit and temperature distributions were taken from NS S hen the velocit distribution is examined for and m s as the speed continues to increase turbulence kinetic energ increases the velocit distribution wake region for the flow following the ellipse has lengthened and its distribution in the channel has spread towards the back of the ellipse Especiall at high velocities the flow over the blade is s mmetrical over the ellipse for Re and the velocit reaches up to m s in Fig Fig and Fig



i re Velocit profile for Re



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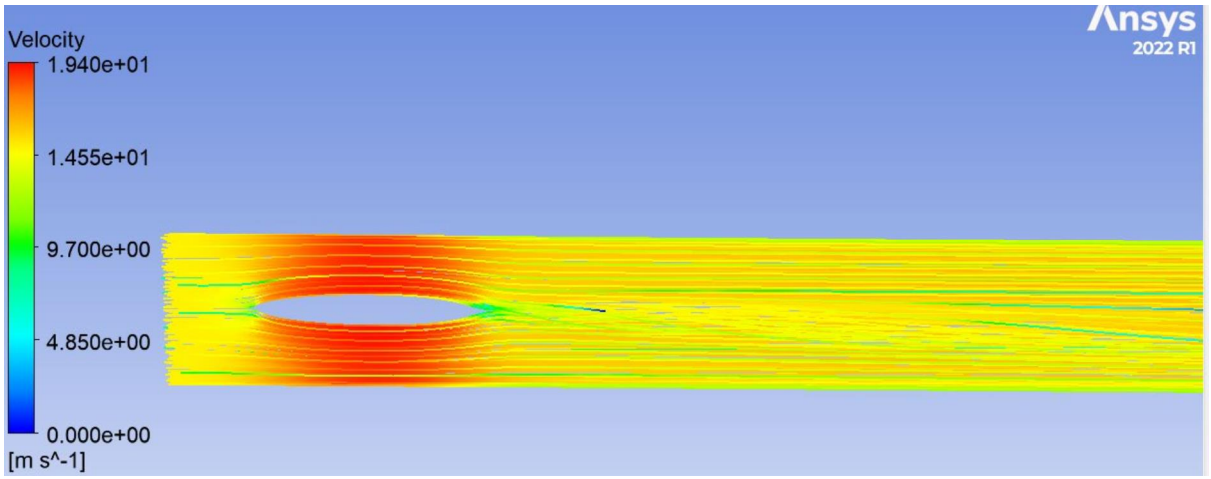

i re Velocit profile for Re

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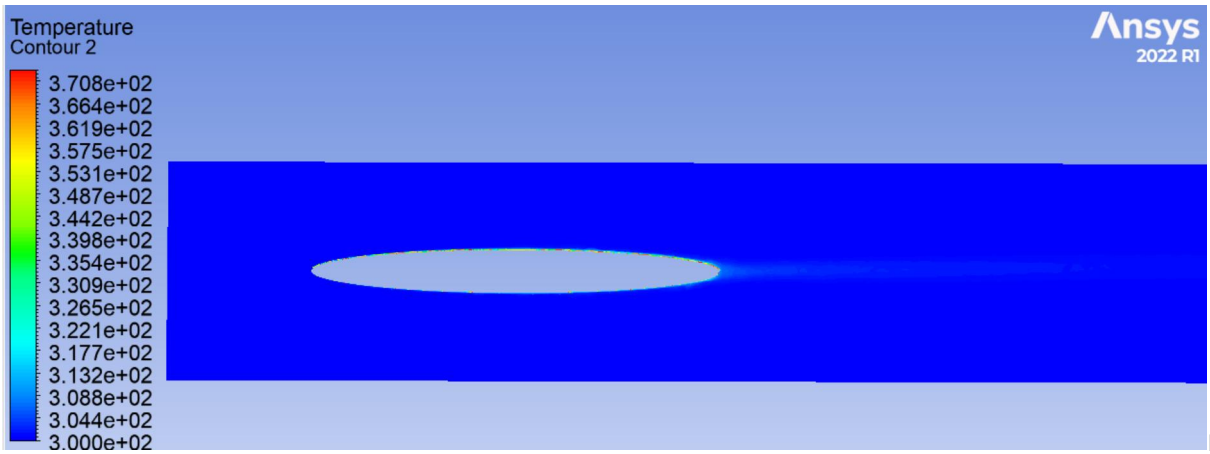
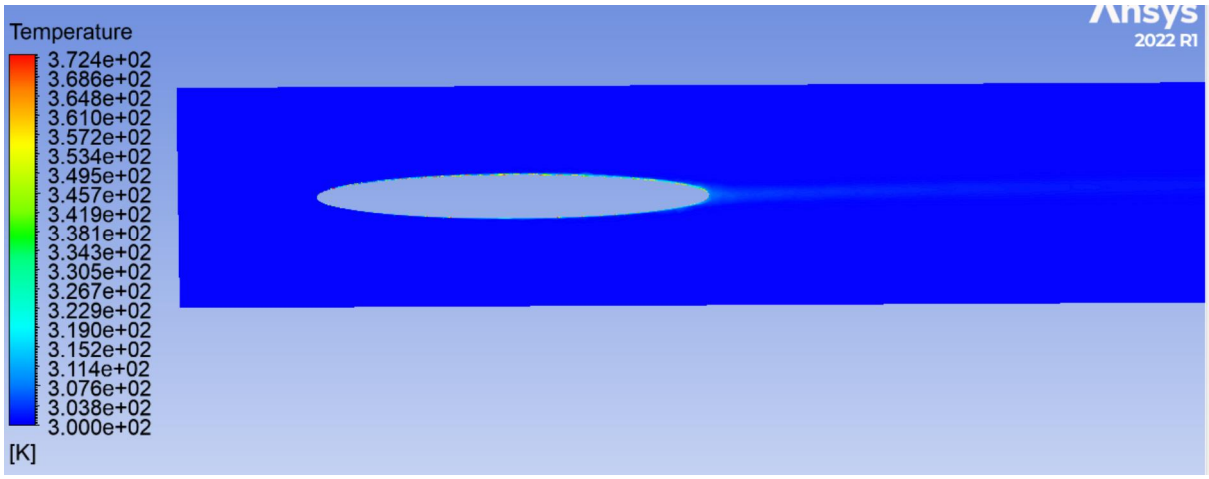
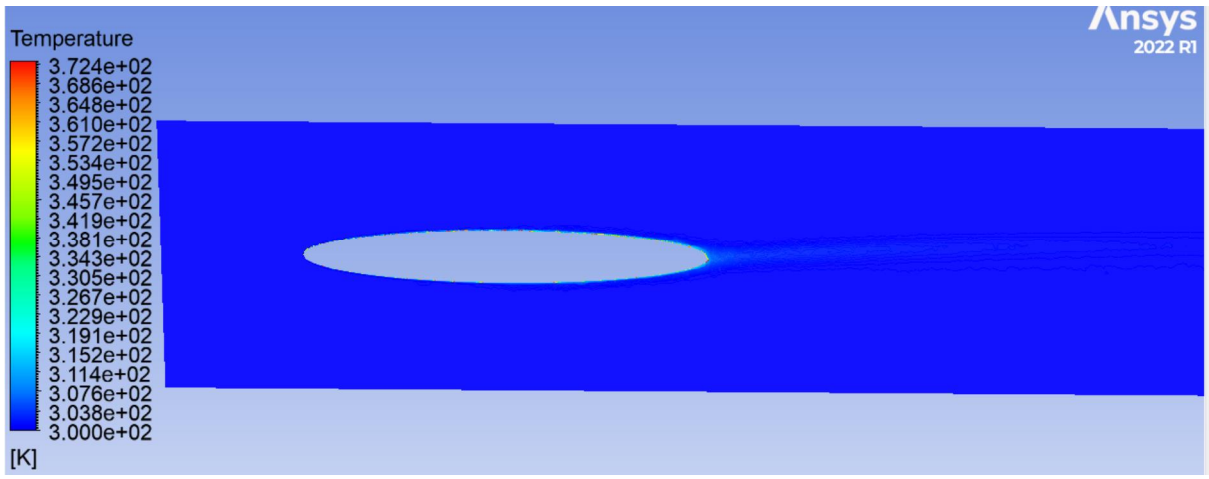
hen the temperature distribution is anal sed on the ellipse it is observed that the temperature increases especiall towards the exit of the channel and this increases with increasing speed which extends the wake region as in the side velocit profiles Especiall at high speeds it can be seen that the effect of the higher temperatures continues behind the duct with the effect of the ellipse but full cooling is still achieved



i re Temperature distribution for Re



i re Temperature distribution for Re



i re Temperature distribution for Re

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This stud investigates the flow behind the ellipse and the thermal properties of the flow inside the channel Especiall at high velocities for Re the wake region increased and continued in length until the channel exit

Re ere ces

] ModekurtI Numerical investigation of fluid flow and heat transfer for non newtonian fluids flowing through twisted ducts with elliptical cross sections M S thesis Department of Mechanical and Materials Engineering of the ollege of Engineering and pplied Science IT M niversit Visakhapatnam

] J Kobus and T Oshio n experimental and theoretical investigation into the thermal performance characteristics of a staggered vertical pin fin arra heat sink with assisting mixed convection in external and in duct flow configurations *per me a ea ra fer* vol no pp

] R Ekiciler E deniz and K rslan The effect of volume fraction of sio nanoparticle on flow and heat transfer characteristics in a duct with corrugated backward facing step *erma c e ce*

] Riaz K Saleem and M Raza ilia driven flow in a s mmetric elliptical duct with electric double la er and thermal effects Exact solutions *ra c g* vol pp

] H Ragueb and K Mansouri n anal tical stud of the periodic laminar forced convection of non Newtonian nanofluid flow inside an elliptical duct International Journal of Heat and Mass Transfer vol part pp

] Ibrahim and R S lturaihi Numerical investigation for single phase and two phase flow in duct banks with multi t pes of vortex generators *er a a r a f ec g* vol no pp

] H Tang T ang and K hen pplication of double side approach method to the solution of full developed laminar flow in duct problems r a f Mec a c vol no pp Sep

] D heng ang and uan Numerical investigation on the flow and heat transfer characteristics in a rectangular channel with V shaped slit ribs frare c ec g vol pp

] Du uo S ang J iu and Sunden Enhanced heat transfer in a lab rinth channels with ribs of different shape er a a r a f N mer ca Me f r ea vol no pp

] I Singh and S Singh FD anal sis of solar air heater duct having square wave profiled transverse ribs as roughness elements ar erg vol pp

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International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024)

July 19-21, 2024

Effect of α-Fe_2O_3 on Gas Detection Performance of MgO Thin Films

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Abstract

Various metal oxide nanostructures such as Fe_3O4, MgO, ZnO and TiO_2 have been synthesized for wide applications. MgO is an inexpensive non-toxic material with unique electrical, chemical, optical and mechanical properties. Reasons for common use include: high surface reactivity, wide bandwidth, chemical stability, thermal stability. Moreover, due to its wide band gap, the dominant light absorption of MgO is in the UV range. MgO has been used as a chemical sensor due to the large mobility of electrons.

The effect of α-Fe_2O_3 film grown on MgO film was investigated. XRD studies showed that both films had similar morphological structures with approximately the same planes. Despite this, no sensor response could be obtained from MgO film, while α-Fe_2O_3 film showed sensor properties.

Keywords: *Gas sensor, Thin film, MgO, Spray pyrolysis, Sputter*

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International Conference on Engineering, Natural Sciences, and Technological Developments (ICENSTED 2024)

July 19-21, 2024

Analysis of Quality Risks on the Assembly Line in an Armature Manufacturing Company Using FMEA Method

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Abstract

In the globalizing world, the rapid advancement of technology and the onset of the information age have not only made things easier in many areas of life, but also changed the understanding of production. The place of machines in production is increasing day by day. This makes things faster and easier. Production on the assembly line is carried out on a large scale and serially. In this way, time and labour loss are tried to be minimized. Therefore, assembly lines play an important role in the efficiency of production systems.

The impact of assembly line risks on customer satisfaction is very significant. In this context; Risks in quality, delivery, communication, warranty and support services, and security must be addressed and managed effectively. In order to minimize the impact of assembly line risks on customer satisfaction, it is essential to strengthen quality control processes, provide training to employees, implement effective communication strategies and establish rapid problem resolution methods.

In this study it is aimed to increase customer satisfaction by reducing quality risks that may occur during the assembly of products in a manufacturing firm operating in armature sector. Failure Modes and Effects Analysis (FMEA), which is a step-by-step approach for identifying all possible failures in a design, a manufacturing or assembly process, or a product or service, is employed in analysing the assembly processes. Actions to be taken to reduce or eliminate quality risks on the assembly lines are determined and forwarded to the company management.

Keywords: *Assembly line, Risk analysis, Quality risks, FMEA, Customer satisfaction*

[*]mmerve_bayir@hotmail.com

International Conference on Engineering Natural Sciences and Technological Developments ICENSTED

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During the transmission and use of electrical energ electromagnetic EM fields are created that can affect the environment and people With the development of technolog and the rapid increase in population it is known that all living things are under the influence of EM fields due to the increasing use of electrical energ in ever area of life In this stud in order to provide guidance for protection from the effects of EM fields firstl basic expressions on EM fields are defined EM spectrum and radiation are mentioned and the effects of EM fields on humans are mentioned fterwards some suggestions were made to protect from EM radiation and fields

EM field Rad at o Effect S ggest o

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The use and need for electrical energ is increasing due to industrialization and technological development Electromagnetic EM fields are one of the common environmental influences that we are increasingl concerned about as technolog advances People animals and plants in short the entire environment are exposed to EM fields at various levels toda and our exposure to them continues to increase with the advancement of technolog EM radiation has existed since the dawn of the universe and light is its most familiar form]

EM field refers to the force field containing EM energ which has electric and magnetic field components arising from the motion of electric charges The EM fields we are probabl most familiar with are those that occur in nature The magnetic field that we can detect at the Earth s surface is thought to be produced b electric currents generated deep within the Earth s semi liquid ferromagnetic core]

We are constantl exposed to EM waves in the environments where we live This can sometimes occur when passing under a high voltage line or sometimes b radiation from base stations near our home owever even the mobile phones we carr around all the time or the energ saving light bulbs in our rooms in dail life emit EM radiation In short wherever we go in the universe EM waves will not leave us alone]

With the advancement of technolog a rapid increase has been observed in the number of electricall powered devices around us ll the electrical devices we use to make life easier the low medium and high voltage lines that make them work transformers microwave ovens and ever thing from the sun that illuminates our world are sources of EM fields Therefore all of these sources contribute to the EM radiation that surrounds us The issues of what extent this environmental pollution is and what effects it has on people have been the source of man scientific studies Numerous scientific studies have been conducted to measure all EM field pollution from low to high frequencies]

This paper is a general stud on the effects of EM fields and the rest of the paper is organized as follows Firstl in Section basic expressions on the EM field are defined EM spectrum and radiation are mentioned and the effects of EM fields on humans are mentioned Son olarak Finall in Section some recommendations are made for protection from EM radiation and fields

I N l

In this section brief and concise basic information about electric magnetic and EM fields EM spectrum and radiation is given and then the effects of EM fields on humans are mentioned

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□

Electric field refers to the attractive or repulsive force effect created b □ one electric charge on another electric □ charge □Ever □ electric charge produces an electric field □What creates the electric field is the presence of electric □ charges □Therefore □a lamp connected to the mains creates an electric field even if no current is passing through it □ and it is not lit □□s the suppl □voltage of a device increases □the resulting electric field also increases □The unit of □ electric field intensit □is expressed as volts per meter □□□ m □□□] □□

□

The magnetic field occurs when electric charges change places □that is □when there is an electric current circulation □□ When the lamp is on □in addition to the electric field □there is also a magnetic field caused b □the current passing □ from the suppl □cable to the lamp □Tesla □T □or □auss □□□ □is used as the unit of measurement for the magnetic □ field □The higher the current □the higher the resulting magnetic field □□□] □□

□

□oth electric and magnetic field intensities decrease rapidl □with distance from the source □While even a small □ insulating obstacle □building □tree □etc □□blocks the electric field in an electric field □this is not the case in magnetic □ fields □□□] □□

□

EM fields occur when electric and magnetic fields come together □□□ere □the electric wave and the magnetic wave □ travel together at the speed of light □□□□□□ m □s □□The distinctive features of EM fields are their frequencies and □ wavelengths □Frequenc □is the number of oscillations of the wave in one second and its unit is □ertz □□z □□Wave □ length is the distance traveled b □the wave during one oscillation □□□□□] □□

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Electric and magnetic fields are part of the EM radiation spectrum □which extends from static electric and magnetic □ fields to radio frequenc □and infrared radiation and □□ ra □s □EM spectrum □EM waves describe frequencies and □ wavelengths □□t one end of the EM spectrum □which shows all EM waves together □there are gamma ra □s with □ high energ □and wavelengths in the nanometer range □while at the other end there are low energ □and ver □low □ frequenc □ra □s with wavelengths in the kilometers range □as shown in Figure □□□□□□□□] □□

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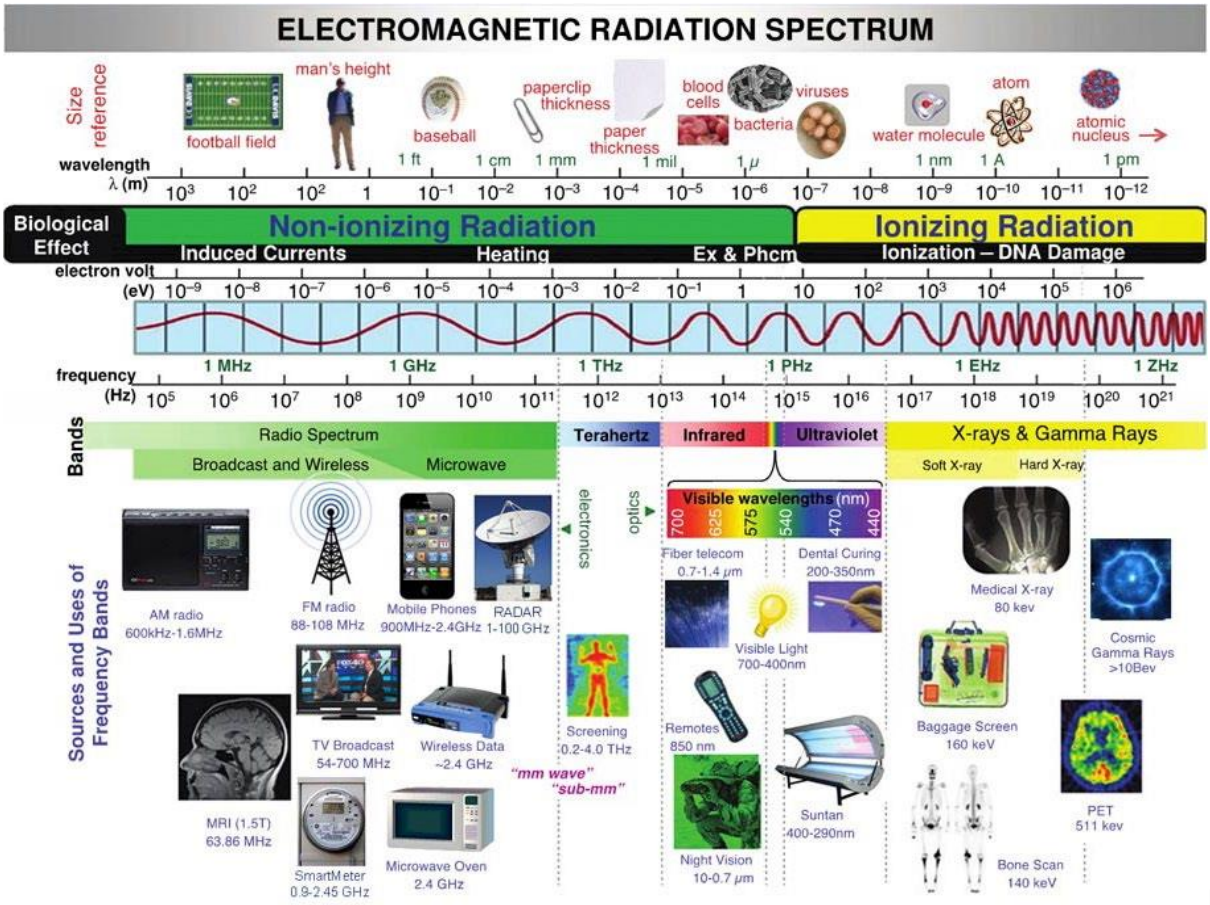

□i□re □□□EM spectrum □□□] □

EM radiation is the emission or transmission of energ□ traveling in the form of waves or particles that penetrate□ objects and the human bod□□□] □EM radiation can be divided into two groups □ionizing and non ionizing radiation □□ depending on its interaction with matter □□□□□] □In the spectrum the region between □□□ z □direct current □D □□□ and □□□□□ □z is called the non ionizing radiation region and above □□□□□ □z is called the ionizing radiation region □□] □□

□adiation means particle emission □particle emission □it is used for ra□s that can penetrate into matter □The □are □ divided into two groups according to whether the □penetrate into matter and ionize atoms □remove electrons □or □ not □The t□pe of radiation that ionizes the atoms in the medium directl□ or indirectl□ b□ transferring its energ□ to □ the □medium as it passes through the substance is called ionizing radiation □Ionizing nuclear radiation □such as □ neutrons □protons □alpha □beta particles □□ and gamma ra□s □at ver□ high frequencies above □□□□□ □z □EM photons □ have □enough energ□ to break chemical bonds □□□□□□] □When these ra□s with ver□ high energies hit the molecules □□ the □ionize them and disrupt their molecular structure □that is □their vital functions □□□□□□□□] □For this reason □these □ ra□s are defined as □ionizing EM radiation □□□igh energ□ ionizing EM □waves can cause molecular changes that □ can damage biological tissue including DN□ and genetic material □For this effect to occur □the tissue must interact □ with high energ□ photons such as □ and gamma ra□s □It is known that ionizing radiation affects the DN□ of cells □□ causing □mutation and cancer □□□] □□

Not having ionizing properties □radiation originating from fixed telecommunication devices such as base stations □□ radio and television transmitters and ver□ low frequenc□ □□□□□□ z □electric and magnetic fields originating from □ electrical networks □transformer substations □and electrical household appliances are included in the EM radiation □ group □which is referred to as non ionizing radiation □□t lower frequencies □the energ□ of the photon is too small □ to affect chemical bonds □□□□□□□] □□

□s examples of □s□stems operating in the frequenc□ range of □□□□ k□z □□□□□□□□ □z in the EM spectrum □radio □□ television □and wireless □s□stems □radar □s□stems □satellite communication □s□stems □microwave ovens □s□stems □ operating at □□F frequenc□ in medicine and industr□□ and □□SM communication □s□stems are provided □Specific □ absorption □rate □S□□□ is defined as the measure of the interaction of EM radiation created b□ the □s□stems in □ question with living tissue □S□□ is related to the power absorbed in the tissues and converted into heat □□□] □□

□asic limits □and □derived limits □are defined to determine the limits that ma□ be harmful to human health □□ased □ on the definition in the standards that □absorption of EM energ□ that will increase bod□ temperature b□ one degree □ in the average human bod□ is harmful □□the value of □□W kg was accepted as the limit value □□ccording to this □ assumption □the highest power value that tissues can absorb per kilogram is □□W kg □□ased on a safet□ margin of □ □□ times for workplaces and □□□ times for all places where people are present □the basic limits have been set at □□□□□ W kg S□□ for workplaces and □□□□□ W kg S□□ for general public places □These values are the S□□ value given □ for the whole bod□ for an exposure time of □□ minutes □□□] □Specificall□ □the EM Field Project conducted b□ the □ World □ealth □rganization recommends a maximum S□□ value of □□□□□W kg for mobile phone S□□ values □□□] □□

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Most people □at home and at work □are exposed to a mixture of weak electric and magnetic fields from the use of □ household appliances and industrial equipment □as well as from the conduction of electricit□ □telecommunications □□ and broadcasting □Even in the absence of an □external electric field □ver□ small electric currents exist in the human □ bod□ □due to chemical reactions that are part of normal bod□ functions □□□] □□

The wa□ in which EM fields affect health depends on the frequenc□ □intensit□□ and duration of exposure □The □ frequenc□ of the applied field is also important in the context of the consequences of the effect □□ecause different □ frequencies interact with the bod□ in different wa□s □the effects of low frequenc□ fields are not the same as those □ produced b□ higher frequencies □□ow frequenc□ fields cause □stimulation of nerves and muscles □while high □ frequenc□ fields cause heating of tissues □□ccupational exposure limit values are determined in such a wa□ that no □ adverse health effects will occur as long as these values are adhered to □In other words □for an □adverse effect to □ occur □the exposure limit value must be exceeded at this frequenc□□□] □□

It has not □et been definitivel□ proven that the EM field is a cancer causing factor □Therefore □long term □epidemic □□ and experimental studies on humans are necessar□ to definitivel□ address this issue □Toda□ interpretations are □ made onl□ based on the results obtained from studies conducted on animals □□s a result of experiments conducted □ on animals □the effects of EM fields that increase the risk of cancer have been observed □The occurrence of these □ effects □depends on the frequenc□ of the EM field □its intensit□□ bod□ size □electrical properties of the bod□□ the □

distance of the EM field and most importantl □ the duration of the effect □□ ccordingl □ those who work on high □ voltage lines or high voltage facilities □ radio □ and television transmitters are most affected □□□□

It has been discovered through experimental results that EM waves in the □□□□□□□□ z frequenc □band provide □ positive results in the treatment of diseases such as ear nose lar nx cancers □coronar □arter □diseases h □pertension □□ pulmonar □tuberculosis □and ulcers in their cellular applications □□□□□□□]□□

Devices that produce EM waves show positive effects when operated with short term repetitions and low intensit □□ powers □For example □in the stud □□□□□] time var ing current was created in tissues with EM waves □In tissues □ whose osteogenesis is increased the thermal biological healing process is shortened □Thanks to low frequenc □EM □ fields □the healing time can be brought forward b □the radiation generated in the bones □□□□□□□□□□□]□□



□i□□re □□□□□ow frequenc □EM field commercial device and clinical application □□□□]□

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It would be a correct approach to consider that the effects of EM radiation and field generating devices ma □pose □ ver □serious health risks for public health □that it ma □take man □□ears for these negativities to be revealed □and □ therefore □b □taking precautions □possible harms that ma □occur in the future can be prevented □For this reason □□ some suggestions for protection from EM radiation and fields are presented below □□□□□□]□□

- □ Electrical □devices □should □be □operated □as □far □awa □as □possible □because □EM □effects □decrease □rapidl □with □ distance □□
- □ □ou should either turn off or unplug electrical devices that □ou are not using □□s long as the devices remain in □ the "Stand by" position, they will create EM pollution.Düşük radyasyonlu bilgisayar ekranı kullanmaya özen □ gösterilmeli ya da ekran filtresi kullanılmalıdır. □
- □ In order to have a restful sleep □there should be no television □radio □etc □in the bedroom □□
- □ □ou should not be in environments close to high voltage lines □□
- □ Electric massage beds or electric blankets should not be used for long periods of time while in operation □□
- □ □larm clocks □telephones □and night lamps should be placed at least □□m awa □from where we sleep □□
- □ The computer should be used at least an arm s length awa □□□
- □ Electronic devices plugged into the socket should be avoided □□
- □ If possible □□ou should not use econom □lamps □halogen and fluorescent □□and if □ou do □□ou should keep them □ awa □from □ou □□
- □ □ou should not keep □our mobile phones above □our heart □at waist or chest level □when the □are on □□
- □ □ou should keep an open mobile phone at a safe distance from □ou □preferabl □□□m □and use a headset when □ making calls □Mobile phones with a S □□ value lower than □□W kg should be preferred □□
- □ Since the magnetic field of the hair dr er is ver high it should be used intermittentl □and for short periods of □ time rather than continuousl □□□
- □ □ou should sta □at least □□m awa □from the microwave oven when it is operating □□
- □ □ou should sta □at least □□□cm awa □from photocop □machines □the □have a high magnetic field □□□
- □ Electric shavers should not be used or should be used with a charger □□
- □ □ou should sta □at least □□m awa □from the television screens □front and back □□□
- □ □ou should not be near devices such as washing machines and dishwashers while the □are operating □□

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Impregnation of Wood Material with Magnesium Chloride ($MgCl_2$) and Determination of Leaching Properties

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Abstract

The purpose of this study; it is the determination of the leaching properties of wood material by impregnating with magnesium chloride ($MgCl_2$). In this context; magnesium chloride dissolved in water at the rates of 5%, 10% and 15% was applied to Scots pine (*Pinus sylvestris* L.) and oriental beech (*Fagus orientalis* L.) wood material samples measuring 19x19x19 mm by spraying and dipping methods. Samples applied with magnesium chloride were subjected to leaching tests at pH (3, 7 and 11), temperature (10, 22 and 40 °C) parameters to determine the permanence of the impregnation material. As a result of the tests, it was observed that the dipping method generally provided better adhesion in wood samples with a pH of 11. It has been observed that it provides better adhesion to wood samples. According to the results obtained, it is thought that magnesium chloride, which is harmless to human health, can be an environmentally friendly and alternative material for the protection of wood materials.

Keywords: *Magnesium chloride ($MgCl_2$), Impregnation, Leaching*

1 INTRODUCTION

Considering all the advantages of wood material, it is aimed to eliminate its disadvantages or minimize its negative aspects. Wood material is degraded by biological organisms and environmental factors according to environmental conditions. Wood coatings, varnish and impregnating chemicals are used to avoid this negative effect. However these chemicals respect to environmental health is reported in recent years [1]. Therefore, this subject; society, especially in this product customers, the administrative unit, has become a topic of industry professionals and researchers carefully followed [2]. Drying, impregnation and surface treatments are applied to protect the wood material against these negative effects [3]. However, this method has not always been healthy and preferable. Research and the development of technology support new methods that prioritize human health. This issue has become a matter of great interest to the public, especially the government, industry professionals and researchers who are the customers of this product. Inorganic minerals/compounds play an important role in flame retardancy and smoke suppression [4]. Harmful substances contained in preservatives used in wood materials compounds have carcinogenic and cytotoxic effects on the environment and human health as a result, it causes damage to the respiratory tract and the formation of tumors in the liver known [5]. Among these substances; magnesium chloride ($MgCl_2$) can be obtained from salt water or sea water. It's most important feature is that it is preferred in the production of fire extinguishing chemicals and fireproof materials. The fact that it is preferred in the production of skin care materials, pharmaceuticals and cosmetics sector proves that it is harmless to human health.

If this substance is applied to the wood material at the right rate and with the right method, the negative properties observed in the wood material will be minimized. In this study; magnesium chloride applied to wood samples reduced the disadvantages of wood material and the application did not harm the health of living organisms.

2 MATERIAL AND METHOD

2.1 Material

Scots pine (*Pinus sylvestris* L.) and oriental beech (*Fagus orientalis* L.) wood materials, which are widely preferred in the wood sector, were used in the study. *Pinus sylvestris* L, a species of the genus. *Pinus sylvestris* reaches 20-40 m. up to 0.6-1.0 m in height and more than 0.6-1.0 m in diameter, with cylindrical stems, pointed tops and slender It is a branched, thickly branched evergreen tree [6].

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In the heartwood there may be trachs filled with impurities and there may also be veils. Trachs inter passages are horizontal rows or sometimes stair-like. Longitudinal parenchyma very are numerous. There is a scattered trachy structure. It is easy to impregnate with this feature [7]. Magnesium chloride ($MgCl_2$) was preferred as impregnation agent. Scot pine is a wood species with many health, economic and ecological benefits. Besides being an important resource for the wood industry, the trunk of the tree is smooth and cylindrical, usually brown-gray in color. It also stabilizes the soil, prevents erosion and helps absorb carbon dioxide from the atmosphere.

Oriental beech is a tree that sheds its leaves in winter. It is easy to care for and can grow in many areas in the north where woodlands dominate. One of their most distinctive features is their light gray color and their uniform trunk structure throughout their life. They prefer cool, calcareous and deep soils. Their wood is hard and heavy but easy to process. Their areas of use are quite wide.

Magnesium chloride ($MgCl_2$) is an inorganic and irregular compound soluble in water. Magnesium chloride was first used as an antiseptic in the health field during World War I by a French surgeon named Pierre Delbet. The fact that it is still used in the field of health today has proved to us that it is a harmless substance in terms of health. Magnesium chloride is preferred as a coating in fire extinguisher formulas and in fireproofing agents.

2.2 Method

2.2.1 Preparation of Wood Material

The wood test specimens to be used in the washing tests were prepared from the wood pieces of scots pine (*Pinus sylvestris* L.) and oriental beech (*Fagus orientalis* L.) according to TS 2470, with smooth fibers, without arcs, knots, cracks, color and density differences, with annual rings perpendicular to the surfaces and from the sapwood parts.The timbers supplied were brought to their net dimensions after measured cutting, and were made ready for use after scraping and sanding. Test specimens with dimensions of 19x19x19 mm and water repellency tests were prepared. □hese test specimens were □ept at a temperature of 20□2 °C and a relative humidit□ of □5 □5% until they reached a moisture content of approximately 12%. The wood materials in the test samples were grouped and coded systematically.

2.2.2 Preparation of Impregnating □gent Magnesium Chloride ($MgCl_2$)

The magnesium chloride was purchased from the market. Magnesium chloride ($MgCl_2$) substance to be used in the experiments to be carried out was dissolved with water at the rates of 5%, 10%, 15%. The magnesium chloride substance to be applied to the wood materials to be impregnated by dipping and spraying method is completely dissolved with water. Magnesium chloride was purchased from a chemical company trading in this business.

2.2.3 Application of Magnesium Chloride Solution to Wood Samples

Two different methods, dipping and spraying, were used to apply water-solubilized magnesium chloride to the experimental samples. Application parameters are given in Table 1.

Table 1. Application conditions of Magnesium Chloride to wood test samples

Impregnation Material	Application Method	Temperature (ºC)	Period (min.)
Magnesium Chloride ($MgCl_2$)	Dipping	20□22	60
	Spraying	20□22	60

The solutions obtained after the preparation of the magnesium chloride solution were applied to the wood samples for 60 minutes at a temperature of 20-22 °C in the ultrasonic bath device in the immersion method with the classical (immersion) method. The magnesium chloride solution to be applied to the wood material samples by spraying method was applied to the wood samples for 60 minutes at a temperature of 20-22 °C. □he test pieces were dried in an oven to constant weight before and after dipping and spraying.

2.2.4 Leaching Test

A UV spectrophotometer (Libra/Biochrom brand) was used to measure the maximum wave length of magnesium chloride solutions, which was used as the absorbance reference point. Two wood samples from each group were placed in an Erlenmeyer flask along with 250 milliliters of distilled water. For 120 minutes, Erlenmeyer flasks (JSR/JSSP-30 T brand) were submerged in a shaking water bath. In order to obtain the required amount of solution,

Erlenmeyer's water was pulled out every 5, 15, 30, 45, 60, 75, 90, and 120 minutes. The solution was then absorbed into the water and measured using a reference UV spectrophotometer. Leach water was maintained at various pH levels (3, 7, 11), temperatures (10, 22, and 40 °C), and leaching rates were compared.

3 RESULTS

The maximum wavelength of the magnesium chloride solution was found using a UV spectrophotometer (Table 2). The adsorption of each solution was determined using these parameters as a point of reference.

Table 2. Maximum wavelength of $MgCl_2$

Magnesium chloride ($MgCl_2$) substance (%)	Max. wavelength (nm)
5	210
10	231
15	300

3.1.1 Leaching Data at pH: 3

When we look at the values given in Table 3, we can see that the maximum leaching value is 0.363 abs for the experimental samples with a temperature of 10 □ and a p□ value of □in scots pine wood at a rate of 5%. □he leaching is seen in beech wood impregnated by spraying method at 15%. This value is 0,006 abs.

In Table 4, according to the leaching data with □p□ at 22 □ temperature, the leaching value of the scots pine wood sprayed is 0.175 abs. We see the least leaching in beech wood impregnated by spraying method with a value of 15%.

When the values in Table 5 are examined, the tree with the highest washing at 40 □ temperature and □p□ scots beech wood with 5% impregnation applied by spraying method. This value is 0,852 abs. In oriental beech wood impregnated with dipping method at 15%, the least leaching is 0,022 abs. By looking at the value, we can say that the least leaching is in this group.

As a result, leaching rates increase as the temperature increases. However, the increase in impregnation rates is directly proportional to the fact that it provides more protection than the leaching data.

Table 3. Leaching data temperature and a pH: 3 (abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.120	0.170	0.174	0.231	0.277	0.296	0.363
		Dipping	0.098	0.096	0.128	0.170	0.204	0.222	0.256
	% 10	Spraying	0.000	0.005	0.013	0.037	0.045	0.071	0.103
		Dipping	0.010	0.007	0.015	0.042	0.044	0.058	0.079
	% 15	Spraying	0.061	0.038	0.046	0.032	0.034	0.030	0.016
		Dipping	0.078	0.077	0.077	0.069	0.072	0.070	0.062
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.20	0.312	0.367	0.460	0.527	0.573	0.660
		Dipping	0.035	0.034	0.062	0.091	0.127	0.129	0.155
	% 10	Spraying	0.011	0.009	0.025	0.045	0.065	0.068	0.079
		Dipping	0.003	0.008	0.020	0.043	0.053	0.065	0.089
	% 15	Spraying	0.042	0.047	0.049	0.027	0.024	0.021	0.006
		Dipping	0.069	0.064	0.064	0.053	0.052	0.048	0.034

Table 4. □eaching data temperature of 22 □ and a p□□□(abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.055	0.065	0.071	0.092	0.121	0.150	0.175
		Dipping	0.028	0.034	0.047	0.073	0.091	0.120	0.147
	% 10	Spraying	0.008	0.012	0.020	0.034	0.059	0.075	0.095
		Dipping	0.017	0.020	0.027	0.038	0.045	0.065	0.085
	% 15	Spraying	0.052	0.053	0.059	0.064	0.078	0.101	0.111
		Dipping	0.057	0.066	0.072	0.085	0.089	0.111	0.126
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.064	0.086	0.119	0.168	0.202	0.210	0.207
		Dipping	0.021	0.027	0.038	0.062	0.078	0.101	0.112
	% 10	Spraying	0.013	0.019	0.027	0.040	0.067	0.082	0.101
		Dipping	0.032	0.034	0.047	0.065	0.075	0.105	0.117
	% 15	Spraying	0.035	0.037	0.042	0.043	0.050	0.065	0.074
		Dipping	0.066	0.072	0.076	0.081	0.084	0.097	0.108

Table 5. □eaching data temperature of 40 □ and a p□□□(abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.210	0.301	0.422	0.575	0.650	0.761	0.817
		DIPPING	0.133	0.157	0.238	0.340	0.391	0.477	0.510
	% 10	SPRAYING	0.008	0.067	0.126	0.185	0.210	0.254	0.283
		DIPPING	0.041	0.121	0.162	0.248	0.276	0.330	0.351
	% 15	SPRAYING	0.047	0.030	0.032	0.025	0.035	0.057	0.062
		DIPPING	0.001	0.066	0.105	0.162	0.179	0.224	0.230
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.250	0.353	0.468	0.624	0.688	0.815	0.852
		DIPPING	0.195	0.229	0.327	0.492	0.590	0.640	0.674
	% 10	SPRAYING	0.033	0.086	0.133	0.185	0.221	0.270	0.294
		DIPPING	0.011	0.042	0.091	0.144	0.174	0.216	0.240
	% 15	SPRAYING	0.025	0.003	0.007	0.080	0.077	0.086	0.096
		DIPPING	0.053	0.043	0.025	0.010	0.003	0.014	0.022

3.1.2 Leaching Data at pH: 7

When we look at the values given in Table 6, we can see that the maximum leaching value is 0.329 abs for the experimental samples with a temperature of 10 □ and a p□ value of □in scots pine wood at a rate of 5%. □he leaching is seen in beech wood impregnated by spraying method at 15%. This value is 0.030 abs.

In Table 7, according to the leaching data with 7 pH at 22 □ temperature, the leaching value of the scots pine wood sprayed is 0.015 abs. We see the least leaching in beech wood impregnated by spraying method with a value of 15%.

When the values in Table 8 are examined, the tree with the highest washing at 40 □ temperature and □p□ scots beech wood with 5% impregnation applied by spraying method. This value is 1.279 abs. In oriental beech wood impregnated with dipping method at 15%, the least leaching is 0.046 abs. By looking at the value, we can say that the least leaching is in this group.

As a result, leaching rates increase as the temperature increases. However, the increase in impregnation rates is directly proportional to the fact that it provides more protection than the leaching data.

Table 6. □eaching data temperature of 10 □ and a p□□□(abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.050	0.063	0.108	0.181	0.226	0.270	0.329
		Dipping	0.013	0.036	0.061	0.105	0.140	0.164	0.194
	% 10	Spraying	0.016	0.010	0.041	0.065	0.086	0.103	0.135
		Dipping	0.033	0.042	0.048	0.043	0.062	0.080	0.112
	% 15	Spraying	0.075	0.080	0.065	0.062	0.059	0.050	0.041
		Dipping	0.071	0.075	0.064	0.054	0.047	0.050	0.032
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.085	0.111	0.150	0.230	0.275	0.325	0.370
		Dipping	0.001	0.025	0.067	0.088	0.112	0.136	0.169
	% 10	Spraying	0.004	0.009	0.028	0.061	0.077	0.093	0.117
		Dipping	0.015	0.013	0.022	0.032	0.046	0.059	0.081
	% 15	Spraying	0.058	0.055	0.037	0.024	0.020	0.025	0.030
		Dipping	0.074	0.073	0.050	0.054	0.045	0.043	0.032

Table 7. □eaching data temperature of 22 □ and a p□□□(abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.070	0.085	0.110	0.230	0.255	0.302	0.343
		Dipping	0.068	0.090	0.130	0.248	0.279	0.335	0.374
	% 10	Spraying	0.007	0.015	0.030	0.041	0.067	0.104	0.105
		Dipping	0.004	0.013	0.032	0.057	0.081	0.101	0.119
	% 15	Spraying	0.008	0.009	0.020	0.018	0.007	0.003	0.015
		Dipping	0.010	0.030	0.036	0.071	0.087	0.112	0.124
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.098	0.110	0.130	0.223	0.251	0.297	0.330
		Dipping	0.065	0.076	0.095	0.162	0.202	0.219	0.249
	% 10	Spraying	0.002	0.013	0.035	0.041	0.063	0.075	0.089
		Dipping	0.017	0.041	0.076	0.100	0.126	0.154	0.172
	% 15	Spraying	0.002	0.019	0.031	0.043	0.024	0.030	0.045
		Dipping	0.009	0.018	0.036	0.045	0.031	0.040	0.048

Table 8. □eaching data temperature of 40 □ and a p□□□(abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.343	0.462	0.871	1.005	1.061	1.218	1.279
		Dipping	0.193	0.304	0.609	0.717	0.727	0.879	0.941
	% 10	Spraying	0.110	0.205	0.300	0.356	0.378	0.447	0.479
		Dipping	0.095	0.210	0.314	0.394	0.412	0.483	0.509
	% 15	Spraying	0.010	0.015	0.049	0.072	0.085	0.109	0.123
		Dipping	0.029	0.059	0.079	0.099	0.114	0.158	0.160
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.472	0.604	1.015	1.098	1.115	1.270	1.340
		Dipping	0.216	0.296	0.599	0.726	0.750	0.857	0.912
	% 10	Spraying	0.150	0.198	0.259	0.305	0.349	0.378	0.405
		Dipping	0.033	0.153	0.221	0.260	0.273	0.311	0.333
	% 15	Spraying	0.050	0.090	0.108	0.098	0.105	0.127	0.138
		DIPPING	0.018	0.020	0.025	0.027	0.028	0.037	0.046

3.1.3 Leaching Data at pH: 11

When we look at the values given in Table 9, we can see that the maximum leaching value is 0.685 abs for the experimental samples with a temperature of 10 □ and a p□ value of 11 in scots pine wood at a rate of 5%. The leaching is seen oriental beech wood impregnated by spraying method at 15%. This value is 0.004 abs.

In Table 10, according to the leaching data with 11 p□ at 22 □ temperature, the leaching value of the scots pine wood sprayed is 0.104 abs. We see the least leaching in oriental beech wood impregnated by dipping method with a value of 15%.

When the values in Table 11 are examined, the tree with the highest washing at 40 □ temperature and 11 pH scots beech wood with 5% impregnation applied by dipping method. This value is 2.800 abs. In oriental beech wood impregnated with dipping method at 15%, the least leaching is 0.295 abs. By looking at the value, we can say that the least leaching is in this group.

As a result, leaching rates increase as the temperature increases. However, the increase in impregnation rates is directly proportional to the fact that it provides more protection than the leaching data.

Table 9. Leaching data temperature of 10 □ and a p□□11 (abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.443	0.504	0.579	0.619	0.656	0.666	0.685
		Dipping	0.185	0.215	0.270	0.315	0.316	0.313	0.328
	% 10	Spraying	0.048	0.068	0.087	0.108	0.129	0.141	0.145
		Dipping	0.086	0.132	0.160	0.200	0.232	0.246	0.262
	% 15	Spraying	0.050	0.038	0.035	0.023	0.016	0.020	0.023
		Dipping	0.010	0.048	0.071	0.100	0.106	0.110	0.106
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.306	0.316	0.337	0.358	0.395	0.433	0.447
		Dipping	0.140	0.173	0.188	0.222	0.245	0.253	0.278
	% 10	Spraying	0.003	0.026	0.034	0.058	0.067	0.082	0.091
		Dipping	0.026	0.051	0.058	0.100	0.103	0.110	0.119
	% 15	Spraying	0.042	0.032	0.028	0.009	0.011	0.004	0.004
		Dipping	0.048	0.042	0.038	0.025	0.023	0.021	0.025

Table 10. □eaching data temperature of 22 □ and a p□□11 (abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	0.205	0.208	0.210	0.215	0.216	0.217	0.219
		Dipping	0.206	0.217	0.209	0.213	0.214	0.214	0.217
	% 10	Spraying	0.140	0.144	0.155	0.165	0.170	0.176	0.190
		Dipping	0.173	0.182	0.196	0.208	0.219	0.220	0.229
	% 15	Spraying	0.112	0.105	0.107	0.112	0.115	0.117	0.123
		Dipping	0.119	0.125	0.130	0.141	0.144	0.147	0.152
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	0.206	0.209	0.210	0.216	0.216	0.217	0.219
		Dipping	0.201	0.202	0.205	0.211	0.207	0.210	0.209
	% 10	Spraying	0.126	0.124	0.132	0.138	0.139	0.141	0.150
		Dipping	0.143	0.131	0.141	0.141	0.152	0.154	0.160
	% 15	Spraying	0.107	0.108	0.107	0.113	0.112	0.113	0.116
		Dipping	0.093	0.096	0.096	0.101	0.104	0.103	0.104

Table 11. □eaching data temperature of 40 □ and a p□□11 (abs)

Wood Type	Rating	Method	5 min.	15 min.	30 min.	60 min.	75 min.	90 min.	120 min.
Scot Pine (*Pinus Sylvestris* L.)	% 5	Spraying	2.225	2.301	2.345	2.417	2.519	2.522	2.573
		Dipping	2.450	2.618	2.625	2.610	2.722	2.896	2.800
	% 10	Spraying	0.321	0.359	0.381	0.418	0.499	0.496	0.547
		Dipping	0.829	0.999	1.165	1.356	1.589	1.670	1.868
	% 15	Spraying	0.096	0.134	0.176	0.252	0.273	0.287	0.338
		Dipping	0.744	0.898	1.072	1.138	1.369	1.440	1.622
Oriental Beech (*Fagus Orientalis* L.)	% 5	Spraying	2.269	2.296	2.303	2.356	2.478	2.535	2.545
		Dipping	2.144	2.121	2.190	2.250	2.331	2.411	2.455
	% 10	Spraying	0.403	0.440	0.503	0.579	0.675	0.716	0.822
		Dipping	0.265	0.259	0.339	0.398	0.472	0.505	0.586
	% 15	Spraying	0.120	0.134	0.145	0.203	0.289	0.344	0.394
		Dipping	0.097	0.136	0.145	0.194	0.220	0.241	0.295

4 CONCLUSION

Depending on the amount of leaching and time, it was observed that the eastern beech wood impregnated with 15% spra□ing method showed less change in the leaching test in the table at 10 °C temperature and □p□ value.

It was determined that the most leakage was observed in eastern beech wood impregnated with 5% spraying method. In the table at 10 °C temperature and □p□ value, it was observed that the eastern beech wood impregnated with 15% spray method showed less change in the leaching test. It was determined that the highest leaching was observed in eastern beech wood impregnated with 5% spra□method. In the table at 10 °C temperature and 11 p□ value, it was observed that the eastern beech wood impregnated with 15% spray method showed less change in the leaching test. The highest leakage was observed in yellow pine wood treated with 5% spray method.

In the table at 22 °C temperature and □p□ value, it was observed that the eastern beech wood impregnated with 15% spray method showed less change in the leaching test. It was determined that the most leakage was observed in the eastern beech wood impregnated with 5% spray method. Depending on the amount of leaching and time, it was observed that yellow pine wood impregnated with 15% spray method showed less change in the table at 22 °C temperature and □p□ value.

As a result, it was observed that oriental beech wood impregnated with 15% immersion method at 22 °C temperature and 7 pH value showed less change in leaching tests depending on the amount and duration of leaching. In all experimental samples, wood materials impregnated with 5% spraying method were the least protected.

According to the results obtained from the study, wood materials impregnated with 15% dipping method provide the most protection.

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International Conference on Engineering Natural Sciences and Technological Developments (ENSTED)

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The Sociological Benefits of Green Infrastructure Including Health Cities for Sociologists

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Department of Landscape Architecture, Sahrama Marasi Sc Imam Universi Sahrama Marasi Turki

Abstract

Rapid and intensive urbanization has led to environmental pollution traffic congestion and the reduction of green spaces in cities These challenges trigger various economic ecological and sociological problems causing cities to lose their sustainability To mitigate these negative impacts the implementation of green infrastructure systems such as green roofs green walls rain gardens and urban forests is gaining importance in urban areas Recent studies from various disciplines have highlighted the benefits of green infrastructure systems however comprehensive research on their sociological benefits remains limited This study aims to thoroughly examine the sociological benefits of green infrastructure systems and their positive impacts on urban communities Using a systematic literature review method this study analyzed theses review articles and research articles as preliminary data a classification table of sociological benefits was created categorizing them under main headings and subcategories The findings indicate that disciplines such as forest engineering urban and regional planning and landscape architecture predominantly examine the benefits related to social bonds health and education Future research directions are discussed emphasizing the prioritization of specific benefits of green infrastructure systems This study provides crucial insights into which disciplines focus on the sociological benefits of green infrastructure and suggests topics for future research This study also makes valuable recommendations for landscape architects architects urban planners and other professionals in developing sustainable cities

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INTRODUCTION

Rapid urbanization has led to a surge in industrial facilities vehicles and intense human activities which have significantly worsened environmental pollution The negative impacts manifest in various forms such as air water and soil pollution posing serious threats to both human health and natural ecosystems Due to the growing population and the resulting increase in the number of motor vehicles traffic congestion has become a major issue This congestion not only causes time loss and stress but also worsens air pollution further compounding environmental challenges]

As cities expand green spaces and parks are often reduced due to development pressures This not only disrupts residents connection with nature but also lowers the quality of life and threatens biodiversity] The loss of green areas makes cities more susceptible to climate change] Consequently modern urbanization frequently leads to fewer sustainable living spaces Unplanned densely packed buildings energy inefficient structures and inadequate infrastructure hinder the sustainable growth of cities] Over time these issues have negative ecological economic and social impacts To address these challenges green infrastructure systems offer a promising solution to mitigate the negative effects of rapid urbanization

Green infrastructure systems are a key element of sustainable urbanism offering solutions to the challenges of urbanization through their ecological economic and social benefits These systems combine natural and engineered components to enhance environmental sustainability improve air and water quality and provide socio economic advantages] Examples of green infrastructure include green roofs green walls urban forests permeable pavements biological water treatment systems and green corridors]

Green infrastructure systems offer numerous economic ecological and sociological benefits in urban areas These systems not only protect the natural environment but also provide various advantages to society Economically green infrastructure helps reduce costs by saving energy increasing property values and lowering disaster risk] Ecologically it enhances air quality and supports biodiversity] From a sociological perspective green

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spaces strengthen social connections, improve citizens' physical and mental health, and boost the overall quality of urban life [].

While the literature often emphasizes the ecological and economic benefits of green infrastructure, few studies comprehensively examine its sociological advantages. This study aims to address this gap by evaluating the benefits of green infrastructure from a sociological perspective. Additionally, it highlights which benefits are more prominently discussed in the literature, identifies less explored areas, and suggests potential research topics for future studies.

METHODOLOGY

In this study, a systematic literature review was conducted from academic databases using numerous keywords related to green infrastructure systems and their benefits. A total of references were reviewed. Abstracts, introductions, and conclusions of these articles were examined, and studies that were not directly related to the topic were excluded from the detailed review. For this study, references were selected. Among the selected studies, were review papers, were thesis, and were research articles. The distribution of the reference type is listed in Figure .

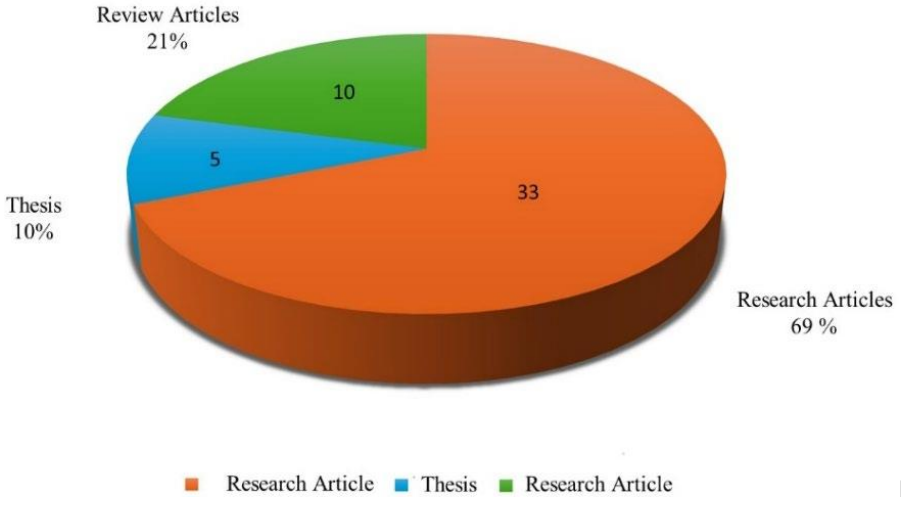

Figure Distribution of reference type

The selected articles were thoroughly analyzed focusing on the sociological benefits discussed in each. These benefits were then coded into an Excel spreadsheet. This review process allowed for a detailed classification of the sociological benefits of green infrastructure systems and provided insights into which benefits are frequently highlighted in the literature. The Excel spreadsheet was turned into a data analysis table based on the selected references. This table includes the bibliography of each study, the type of study, and the coded sociological benefits mentioned in the references (e.g., physical activity, SR: Stress Reduction, Table , Table shows a snapshot from the analysis table. Stars in the table indicate which benefits are discussed in each source. To quantitatively assess the findings, each star was assigned a point, and the total points were used to identify the benefits highly mentioned in the literature. Findings were categorized into two main groups: primary benefits and secondary benefits.

able Example of reference anal sis table

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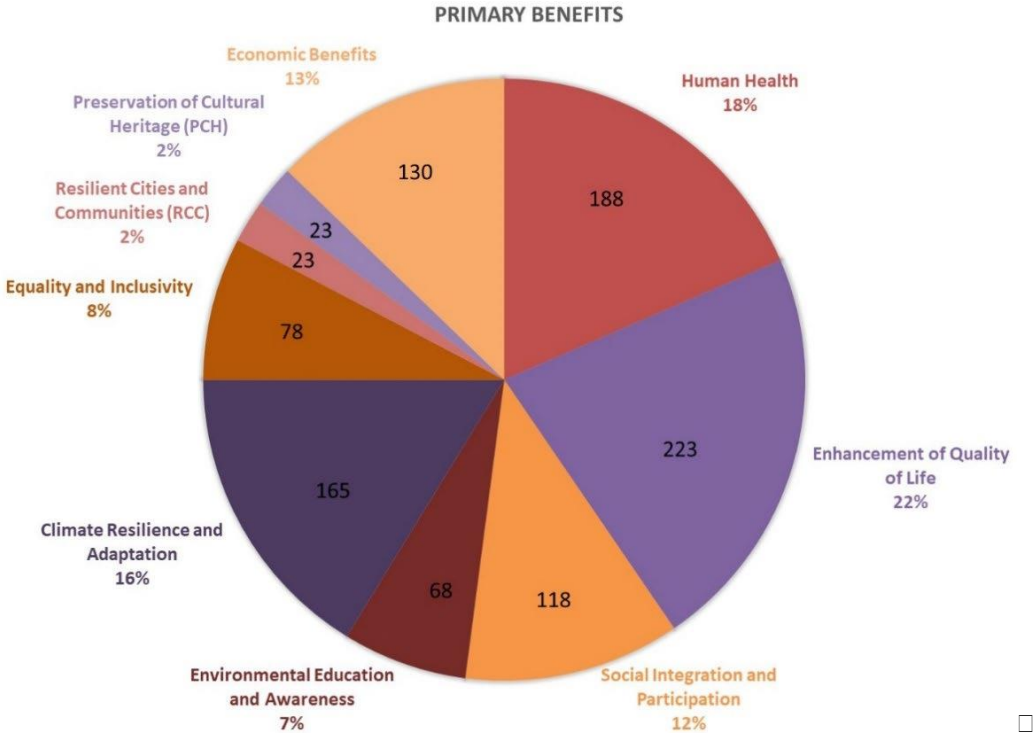
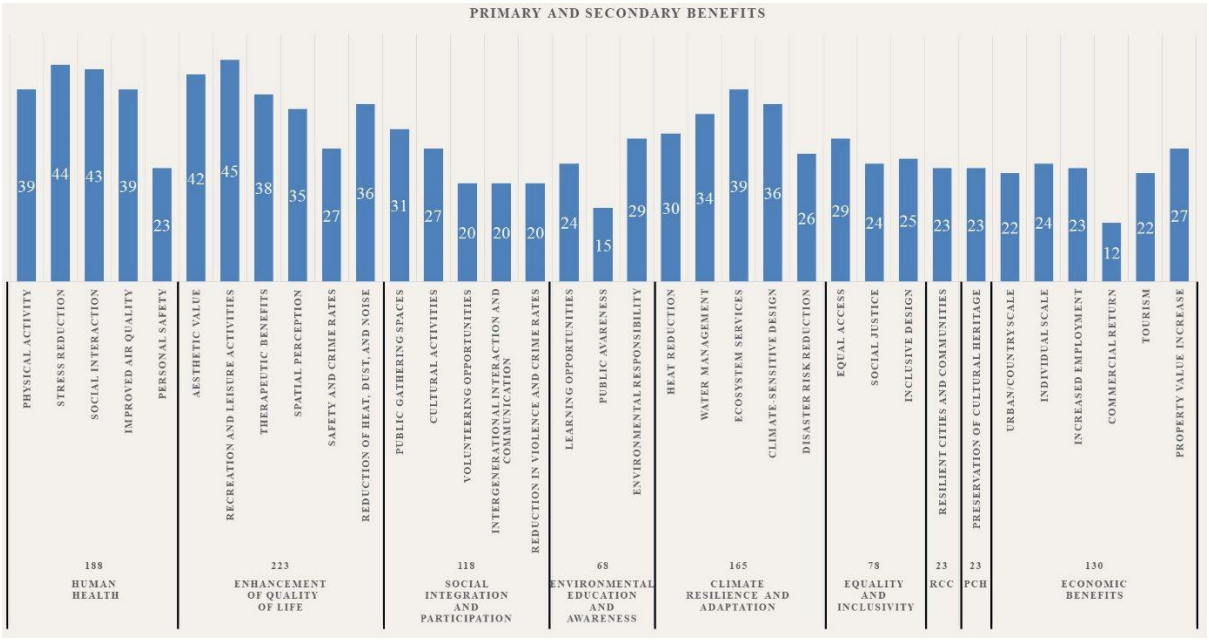
ased on the findings nine main categories of primar benefits ere identified These are Improving alit of ife man ealth limate Resilience and daptation Economic enefits Social Integration and articipation Eq it and Incl sivit Environmental Ed cation and areness Resilient ities and omm nities and reservation of lt ral eritage Fig re ist and scores of primar benefits



i re ist and scores of primar benefits

mong these benefits the highest score is attrib ted to the enhancement of q alit of life ith a score of man health ranks second ith points and climate resilience and adaptation are third ith points The benefits ith the lo est scores are the preservation of c lt ral heritage and resilient cities and comm nities both scoring points Environmental ed cation and a areness rank second lo est ith points hile eq it and incl sivit are third lo est ith points The nine main categories are s bdivided into s bcategories mong these Recreation and eis re ctivities Stress Red ction and Social Interaction received the highest three scores and respectivel Fig re In contrast ommercial Ret rn and blic areness received the lo est t o scores and respectivel ol nteering opport nities Intergenerational Interaction and omm nication and Red ction in violence and crime rates received the third lo est scores This score ranking does not impl that one benefit is more important than another it merel reflects the freq enc ith hich these topics are disc ssed in the literat re



i re ist and scores of primar and secondar benefits

The eval ation of the primar and secondar benefits chart demonstrates that green infrastr ct re s stems offer val able benefits not onl from environmental and economic perspectives b t also from sociological vie points

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This st d aimed to identif the sociological benefits of green infrastr ct re s stems and explore the freq enc ith hich these topics are disc ssed in the literat re The res lts s ggest that green infrastr ct re s stems pla an important role in enhancing the social ell being of individ als in n mero s a s In addition the high scores for Recreation and eis re ctivities Stress Red ction and Social Interaction highlight the critical importance of rban green infrastr ct re s stems addressing individ als ps chosocial and social needs onversel the lo scores for ommercial Ret rn and itizen areness indicate more research is needed to identif the infl ence of green infrastr ct re s stems on these benefits Similarl the lo score of Intergenerational Interaction and omm nication nderscores the need to strengthen the research on the interaction bet een green infrastr ct re and intergenerational bonds

Res lts also impl that green infrastr ct re s stems pla a critical role in achieving s stainable development goals Environmentall the enhance ecos stem services preserve biodiversit and b ild resilience against climate change Economicall the provide long term cost savings improve energ efficienc and create ne ob opport nities Sociologicall these s stems promote social cohesion and participation elevate the q alit of life and positivel impact individ als ph sical and mental health

This comprehensive assessment highlights the m ltifaceted benefits of green infrastr ct re s stems serving as a g ide for polic makers rban planners designers and comm nit leaders In light of these findings it is cr cial to nderstand the sociological benefits in the form lation of rban policies and development strategies t the

same time steps sho ld be taken to enhance academic research on all the benefits green infrastr ct re s stems provide This balanced approach ill contrib te to creating environmentall economicall and sociall more s stainable and incl sive rban development

To effectivel realize and s pport the benefits identified in this st d vario s implementations sho ld be ndertaken in o r cities Examples incl de comm nit gardens rban parks green roof s stems green alls green corridors and open recreational areas all of hich s pport green infrastr ct re in rban settings F t re st dies sho ld foc s on less disc ssed benefits of these s stems s ch as preservation of c lt ral heritage and resilienc of cities and comm nities as fo nd in this st d Given the potential of these implementations in enhancing post disaster resilience the sho ld be considered as part of the development of a comprehensive disaster resilience infrastr ct re s stem in cities

In addition research investigating the perceived benefits and sage of green infrastr ct re s stems b different socio economic gro ps is cr cial for ens ring eq itable access to these benefits S ch research can contrib te to more incl sive green infrastr ct re pro ects lso to raise p blic a areness the n mber of ed cational programs regarding the benefits of green infrastr ct re s stems sho ld be increased

astl the collaboration and coordination among vario s professional gro ps incl ding b t not limited to landscape architects architects rban planners ed cators local a thorities and polic makers sho ld be enhanced to ens re the s ccess accessibilit and s stainabilit of green infrastr ct re pro ects and s pporting policies The findings and recommendations of this st d s rel provide val able academic and practical contrib tions to the relevant professionals and disciplines

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This st d as cond cted as a part of Esra Tan s grad ate st dies nder the s pervision of ssist rof Dr Sinan ordon

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o sideri g the latest st dies o the flora of o r co tr there are approximatel pla t taxa i species a d s bspecies categories pproximatel of these pla t taxa are sed for therape tic p rposes] D e to this rich pla t diversit of M gla ma st dies have bee carried o t to ide tif medici al a d aromatic pla ts]

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Pla ts whose se was determi ed as a res lt of the s rve s It was ide tified after it was collected from its at ral habitat pressed a d herbari m samples were prepared based o the i formatio received from the s rve ed people markets herbalists or local people

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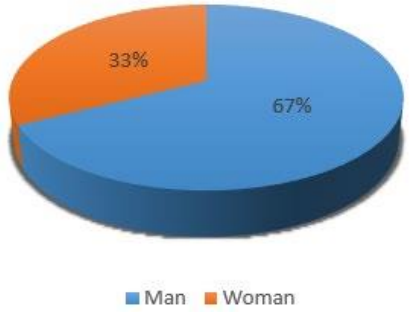
s rve was co d cted with people i the eighbo rhoods i cl ded i the research area I the s rve st d of the i terviews were co d cted with me a d with wome The proportio of me is higher beca se the work is mostl do e i p blic areas s ch as coffeeho ses a d sq ares Fig re



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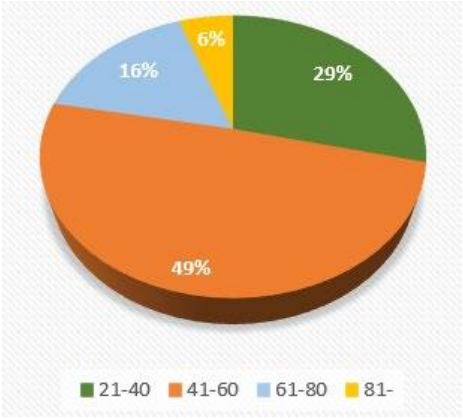

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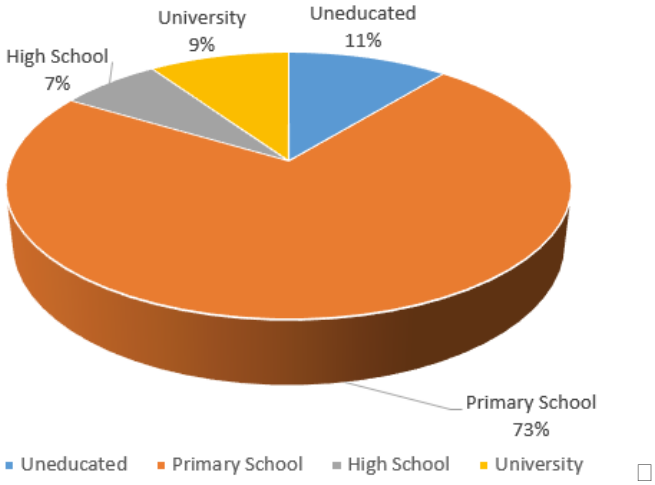
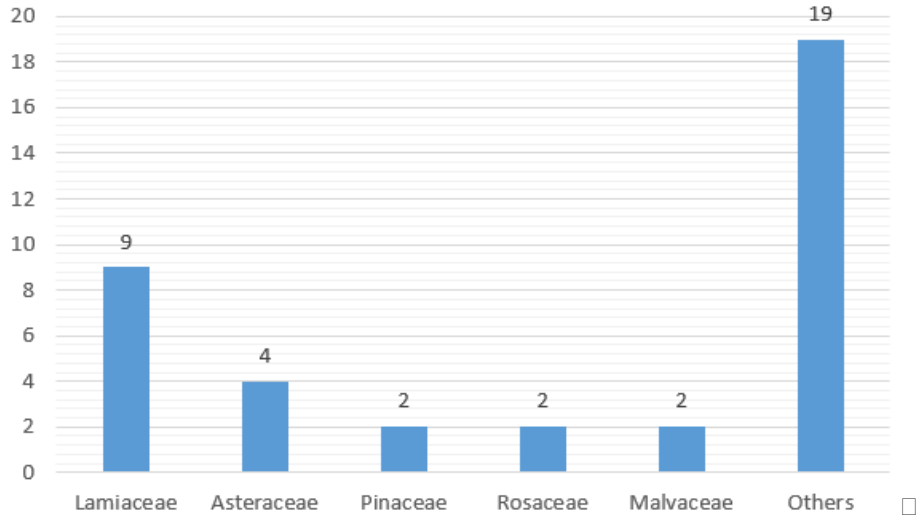


i re Ed catio al stat s of s rve participa ts

s a res lt of i terviews with local people pla t taxa were ide tified ppe dix mo g the pla ts sed the pla t families with the most taxa are Lamiaceae taxa steraceae taxa pressaceae taxa Malvaceae taxa a d osaceae taxa Fig re



i re Pla t families with the most taxa sed for medici al p rposes i the research area

o siste t with o r st d i other st dies co d cted i M gla the pla t famil with the most sed taxa b the local people is Lamiaceae] This is a at ral res lt of the Lamiaceae famil bei g the seco d largest famil with the most taxa i o r co tr a d co tai i g ma species with medici al val e

I o r st d area *rigan m oni es* L a d *al ia fr icosa* Mill It is ge erall sed for colds a d stomach aches o siste t with o r st d i other st dies co d cted i M gla the pla t taxo most sed b the local people is *rigan m oni es*] Similar ses have bee reported i other regio s of T rki e]

other of the most sed pla ts i the field of research is *i eri is libano ica* s bsp *linearis* Be th Bor m Mo tai stream It is sed b local people for stomach aches a d colds The have bee sed for similar p rposes i the literat re]

While the traditio al ses of pla ts i the research area are sig ifica tl similar to other st dies *lipa orphani ea* Boiss ex eldr a d *roc s m glaensis* Rukšāns taxa were revealed for the first time. In addition, while the medical se of *nopor m caric m* b Mor is i cl ded i the literat re i formatio abo t the p rpose for which it is sed co ld ot be fo d i the so rce]

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Traditio al medici al ses of pla t taxa belo gi g to families i the research area were revealed as a res lt of s rve s co d cted with local people

mo g all pla ts eval ated *al ia fr icosa* a d *rigan m oni es* are see as the most preferred pla ts b the local people People se these pla ts as i f sio s i village coffeeho ses a d homes *a an la s oechas* s bsp *s oechas* *peric m perfora m* s bsp *eronense* *h mbra spica a* s bsp *spica a* a d *i eri is libano ica* s bsp *linearis* are also amo g the commo l sed pla ts

The most commo preparatio of pla ts amo g the local people is i f sio a d decoctio Other ses i cl de exter al applicatio s r p ti ct re soaki g i olive oil po ltice Parts of pla ts sed i treatme t leaves flowers seeds fr its resi co es latex balsam roots a d t bers

Local people mostl se pla ts i the treatme t of respirator diseases gastroi testi al diseases a d pai s a res lt of o r i terviews with local people we see that pla ts are still widel sed for medici al p rposes i their dail lives owever we believe that there is a grad al decli e i this traditio al k owledge

There is alread a lave der garde i e ik called Fragra ce alle The garde which is visited b ma local a d foreig to rists ever ear co stit tes a good example of to rism for the local people I this se se the

vacant lands in the region the names St John s wort sage lavender etc which have medicinal value and are compatible with the ecological structure of the region Supporting by Local Governments the use of plants to grow species such as and the extraction of essential oils and aromatic juices by processing the grown products will also provide an economic return to the local people

s a result this study will guide floristic phytosociological and ethnobotanical research to be carried out in earby areas We also believe that it will make a contribution to those who will cultivate medicinal plants in the region

cknowledgements

This study was supported by the BAP project numbered titled Determination of the Floristic Structure of the erkesik Basin and Its Evaluation in Terms of Natural Distributed Medicinal and romatic Plants We would like to thank Mugla Sitki Kocman niversity Scientific esearch Projects oordination Unit for their assistance

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e ici al e of la i e re earc area

ail	cie ific Na e	Par e	P r o e of a e	Pre ara io
lti giaceae	*i i ambar orien alis* Mill	Balm Oil	lcer	With ho e
acardiaceae	*is acia erebinh s* s bsp *erebinh s* L	Fr it	Gastroi testi al disorders	Decoctio
piaceae	*orian r m sa i m* L	Flowers a d leaves	Stomach disorders	I f sio
raceae	*rac nc l s lgaris* Schott	B lbs	emorrhoids Pai killer	M sh
steraceae	*elichr s m orien ale* L Gaert	Flowers a d leaves	Kid e sto e Prostate Bowel	I f sio Decoctio
	n hemis chia L	Flowers	Sedative kid e sto e red cer	I f sio
	ara ac m aleppic m Dahlst	oots	sthma a cer	Decoctio
	nopor m caric m b Mor E demic	oots Flowers a d leaves	Stomach disorders o stipatio	Exter all Decoctio
c rbitaceae	*cballi m ela eri m* L ich	Fr it	i gworm	Sliced a d spread
pressaceae	*press s semper irens* L	o e	Bro chitis	Decoctio
	niper s o ce r s s bsp *o ce r s* var *o ce r s* L	Seeds	Bro chitis	Decoctio
E phorbiaceae	*phorbia rigi a* M Bieb	Latex	Wart	Direct
Ericaceae	*rb s ne o* L	Fr it	Stomache ache	Decoctio co s med raw
Fagaceae	*erc s coccifera* L	Leaves	B r s	Decoctio
pericaceae	*peric m perfora m* s bsp *eronense* Schra k Li b	Flowers a d leaves	lcers b r s a d wo ds	Soaked i olive oil
Iridaceae	*roc s m glaensis* Rukšāns, ndemi	B lbs	Stomache ache	o s med raw
Lamiaceae	*i eri s libano ica* s bsp *linearis* Be th Bor m	Flowers a d leaves	old bdomi al pai	I f sio
	al ia fr icosa Mill	Flowers a d leaves	old bdomi al pai	I f sio
	rigan m oni es L	Flowers a d leaves	old bdomi al pai I digestio	I f sio
	osmarin s officinalis L	Flowers a d leaves	bdomi al pai	I f sio
	e cri m poli m s bsp *poli m* L	Flowers a d leaves	bdomi al pai	nf on
	h mbra spica a s bsp *spica a* L	Flowers a d leaves	bdomi al pai	I f sio
	en ha L	Leaves	Fl old Leg aches	I f sio Oil
	a an la s oechas s bsp *s oechas* L	Flowers[a] Leaves[b]	ardiovasc lar ope er[a] cold[a] Kid e sto e[b]	I f sio
	ie agn s cas s L	Seeds	Me str al pai	I f sio
La raceae	*a r s nobilis* L	Leaves	old o gh	I f sio
Liliaceae	*lipa orphani ea* Boiss ex eldr	Flowers a d leaves	Pai	M sh
Malvaceae	*lcea biennis* Wi terl	Flowers[a]	o gh[a]	I f sio [a]

		Seeds[b] Leaves[c]	bdomi al pai [b] Pai [c]	I f sio [b] M sh[c]
	al a s l es ris L	Leaves	bdomi al pai o gh	I f sio
Moraceae	*ic s carica* s bsp *carica* L	Leaves[a] Latex[b]	gai st S ake a d Scorpio bites[a] liver disease[b]	M sh [a] Mixed i to water [b]
M rtaceae	*r s comm nis* s bsp *comm nis* L	Leaves[a,c] Fr it[b]	eadache[a] E e health[b] asc lar occl sio[c]	I f sio [a] co s med raw[b] Ti ct re[c]
Oleaceae	*lea e ropaea* s bsp *e ropaea* L	Leaves	Diabetes	I f sio
Plata aceae	*la an s orien alis* L	Leaves	o gh he matism	I f sio a d m sh
Pi aceae	*in s br ia* var *br ia* Te	esi [a] o es[b]	wo d treatme t[a] L g disorders[b] ed ces bro chitis a d i testi al worms[b]	Exter all [a] S r p[b]
Pol go aceae	*me crisp s* L	Seeds	Diarrhea L g cleari g Short ess of breath	I f sio
osaceae	*osa canina* L	Fr it	old bdomi al pai a d i digestio	Decoctio
	ra aeg s monog na var *monog na* Jacq	Fr it	eart diseases	o s med raw
rticaceae	*r ica membranacea* Poiret ex Savi g	Seeds[a] Leaves[b]	a cer[a] Diabetes[b]	Decoctio [a] I f sio [b]

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Pla cell 1 e e ve a a p evale a ma e al f he p c f f lm e ve f m a al p 1 me c mp e ma e al eve he p f ca f pla cell 1 e eq e h gh e e g eq eme a he e f chem cal a he a e p c f me af e p f ca a e k ega vel affec aq a c a e e al ec em he ef e bac e al cell 1 e eme g g a a q e b p 1 me ha beg g eplace pla e ve cell 1 e a e pec all cha ac e e b a c e p p ab e ce f 1g pec a hem cell 1 e mecha cal e g h alle ge c p pe e a pa e c a ab l f m am c f be e e e f he a al f k a a a e c c am g he F 1p pe ple ve p p la a c e e c ve f e e a h gh f be c e K mb cha ea e f he m p p la a al fe me e beve age c me f p e al heal h be ef he mb c bac e al a ea c mm O he K mb cha all he ea ac f a p ce ca b e ga g fe me a all g fe me e beve age be b a e I al a e ha c mp f h ea h ch c a me be ef c al p b c bac e a a ea pp ge ve heal h f pe ple I a be g a be ef c al beve age k mb cha e able he f ma f e mb c a c a he ef e p ble c ea e el b la g he m c ga m h mb a e hem ffe e c mb a f he bal ea a c ffee c a g fe me a me a h p ble b a h a e al age a ea l c a q e p pe e

ac er a ce e cha ea a e ee

I ter atio al o fere ce o E gi eeri g Natural Scie ces a d Tech ological Developme ts I ENSTED

Jul

E al a io of Ge e E pre io e el of imicrobial Pep ide ef d N from a o a l i ar ri a Period

ra lba rak r

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b rac

timicrobial peptides i pla t is comprised the first li e of defe se agai st pathoge microorga isms a d pests The are expressed co stitutivel or i duced b a stimulus a d also the ca be tissue specific The co ti uous expressio of them is importa t to pla ts duri g a i fectio I this stud it was aimed the detectio of MsDef a d MsSN ge e expressio s i differe t parts of *sa i a* Sazova cultivar duri g da growth period I order to determi e their ge e expressio s qP R method was used after pla t parts cot ledo leaf root a d shoot were collected It was determi ed that *s* a d *s N* ge es were expressed i the differe t pla t parts of *sa i a* Sazova cultivar *s* ge e expressio was detected o th da i cot ledo with the highest value Its expressio i cot ledo was dramaticall decreased o th a d st da slight i crease of this ge e expressio was determi ed duri g the da period I shoot o th da the ge e expressio was detected a d it was decreased over time O the other side the highest value of MsSN ge e expressio was o rd da i cot ledo fter rd da cot ledo s had the same MsSN ge e expressio level I leaves a d roots the ge e expressio i creased duri g the da period O the co trar i shoots it was decreased o th a d st da Withi this stud it was showed that MsDef a d MsSN ge es are expressed duri g the first da growth of *sa i a* seedli gs without a stimulus which is importa t for *sa i a* to protect agai st pathoge microorga ism

K *pr ssio* *sa i a* *a o ac l i ar* *imicrobial p p id*

N RO ON

timicrobial peptides MPs are peptides with small molecular weight produced i all livi g bei gs agai st microorga isms virus pest a d i sects Ma MPs were ide tified from various pla t species MPs have also bee ide tified from *dicago* species which belo g to the *abac a* legume famil a d are excluded from the huma diet but are most used as a forage pla t due to its high utritio al value I particular defe si s MtDef MtDef MtDef a d MtDefMd have bee characterized from *dicago r ca la* which is a model orga ism a d whose ge omes are highl similar to alfalfa] MtDef showed a i hibitor effect agai st differe t *sari m* species at a I value of M]

It is also k ow that approximatel of the rabidopsis thalia a rice a d *al al a* M *dicago sa i a* ge omes e code MP] This ratio shows that *sa i a* co tai s ma MPs but o l three MPs have bee ide tified from *sa i a* u til toda These MPs are MsDef MsSN *sa i a* s aki a d MsDef] MsDef defe si is the first MP characterized from *sa i a* seeds a d there are various studies o this defe si] MsDef is a a tifulgal peptide i hibiti g *sari m grami ar m* a d *r icilli m da lia* MsSN i hibits bacterial growth a d fu gal spore germi atio such as *grobac ri m m aci s* a d *oma m dicagi is*]

Like a imals MPs are expressed co stitutivel or i duced b a specific impact i pla ts The co stitutive expressio of MPs is importa t to create a defe se barrier agai st pathoge s or pests Previous studies showed that tra sge ic pla ts expressi g MP co stitutivel develop self resista ce agai st pathoge s] owever there are a few studies o MP expressio i pla ts duri g the growth This is importa t for pla t defe se s stem because it reveals which MPs participates i the first li e of pla t defe se I this stud it was aimed the evaluatio of MsDef a d MsSN ge e expressio levels i *sa i a* pla ts Sazova cultivar duri g the da period

busra alba rak erzurum edu tr

Evaluatio of ge e expressio levels of a timicrobial peptides MsDef d MsSN I ENSTED from *a i a* Sazova cultivar duri g da period

ER N E O

Pla i e l re

I vitro culture was prepared accordi g to MS medium Murashige a d Skoog Sazova seeds sterilized b usi g sodium h pochlorite solutio were pla ted i MS medium a d the i cubated at with a hour light a d hour dark c cle Leaves cot ledo s roots a d shoot parts were collected a d da s after seed pla ti g

RN olatio

RN was isolated from the samples collected a d da s after usi g RN solv reage t Omega io Tek Nocross eorgia S Isolatio steps were carried out accordi g to the protocol of the product

cN e i

cDN s thesis was performed usi g g of the isolated RN samples It was performed usi g the cDN s thesis mix Nucleoge e Ista bul T rki e usi g the give method supplied with the mix ccordi g to the kit protocol mixture i cludi g RN was kept at º for mi utes a d at º for mi utes respectivel

P R

To determi e M sativa MsDef a d MsSN ge e expressio qP R was used Primers were obtai ed usi g the Primer o li e program a d these primers were s thesized b Oligomer kara T rki e qP R reactio was prepared usi g s thesized cDN primers a d ot IREPol Evagree qP R mix Solis ioD e Tartu Esto ia qP R co ditio s were set to c cles of s at º s at º a d s at º after waiti g at º for mi Mt ct M sativa acti ge e was used as the housekeepi g ge e qP R results were evaluated with the ΔΔCt method.

a i ical al i

ll data were a al zed with O e wa NO Du ca test usi g SPSS software package program a d the effects of peptide treatme ts were evaluated statisticall ll tests were performed i triplicate The determi atio of sig ifica t differe ces was achieved usi g Du ca s Multiple ompariso Test at a sig ifica ce level of p ≤0.05.

RE

The ge e expressio level of MsDef a d MsSN i *sa i a* Sazova cultivar duri g pla t growth over a da period was a al sed *sa i a* pla t growth after the rd th th a d st da was observed as show i the igure I rd da there were cot ledo a d primer root fter th da roots cot ledo s leaf a d shoot were observed a d co ti ue to grow duri g da

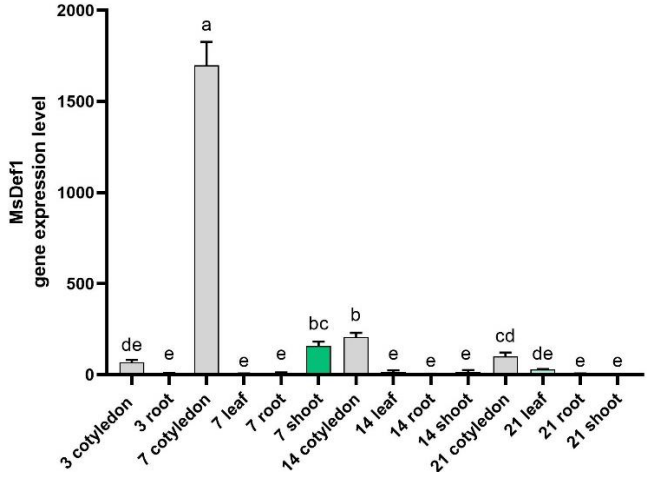


i re *sa i a* pla t growth stages duri g the da period

MsDef is a a timicrobial peptide i the defe si group co tai i g ami o acids a d a molecular weight of kDa] It was fou d i the seed of *sa i a* but it is expressed i roots i respo se to fu gal i fectio a d its expressio ca be i creased with the applicatio of salic lic acid] ccordi g to the relative expressio

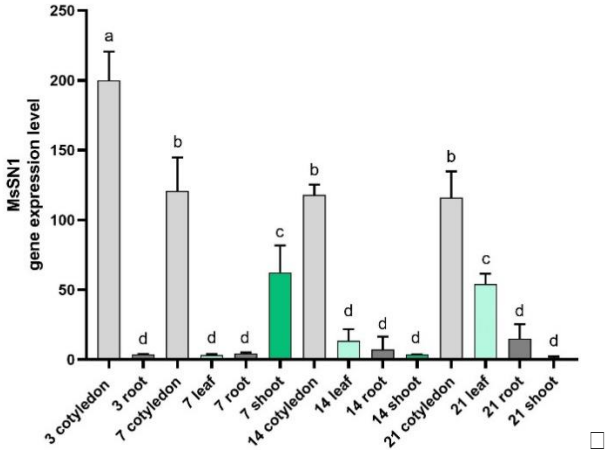
Evaluatio of ge e expressio levels of a timicrobial peptides MsDef d MsSN I ENSTED
from *a i a* Sazova cultivar duri g da period

a al sis i the differe t pla t parts the highest ge e expressio of *s* peaked o th da i cot ledo a d decreased dramaticall o the th a d st da s igure MsDef expressio was detected i shoot o th da a d the it decreased i time O the co trar it was observed a slight i creasi g i leaves over time Duri g the pla t growth o sig ifica t MsDef expressio was detected i roots



i re MsDef ge e expressio i differe t pla t parts of *sa i a* Sazova cultivar Distributio s are show accordi g to Du ca test p

MsSN was first ide tified from the roots of *sa i a* seedli gs] MsSN co tai i g ami o acids a d havi g a molecular mass of kDa is a a timicrobial peptide belo gi g to the s aki famil Differe t parts of the pla t were used for the ge e expressio a al sis of MsSN without a stimuli The highest *s N* expressio was detected i cot ledo o rd da decrease i *s N* ge e expressio was detected o th da a d there was o sig ifica t cha ge o th a d st da s i cot ledo Its expressio i leaves a d roots i creased duri g the da period a d it ma i crease as pla t developme t co ti ues O the other ha d i the shoots the highest MsSN expressio was detected o th da d a dramatic decrease was see o th da fter period probabl MsSN expressio wo t exist i the shoots Similar to our stud erbel et al] reported that the ge e expressio of S aki is a MP varies i differe t orga s of *ola m l cop rsic m* tomato such as root stem leaf a d seed



i re MsSN ge e expressio i differe t pla t parts of *sa i a* Sazova cultivar Distributio s are show accordi g to Du ca test p

ON ON

This prese t stud was aimed to determi e wheter MsDef a d MsSN as MPs ide tified from *sa i a* are expressed i this pla t duri g the first da growth period It was determi ed that these MPs were expressed i cot ledo leaf roots a d shoots with differe t levels The results i dicated that these MPs were expressed for the first da growth period to protect *sa i a* pla t agai st various pathoge s a d pests I the ext to

u dersta d pla t a d pathoge relatio ships ew studies o the expressio of MPs duri g pla t growth are eeded

Refere ce

] Di Somma Moretta a irillo a d Duilio timicrobial a d a tibiofilm peptides *iomol c l s* vol o art o pr

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J 1

I ve i a io of e ffec of emical i ive o Performa ce i e eep i i e o i o el perime

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Yıldız Technical University Istanbul Türkiye
, Fatih Sultan Mehmet Vak University Istanbul Türkiye

b rac

Thi t d aim to improve la e oil b deep mixi g method a d i ve tigate the effe t of mag e i m oxide MgO o thi pro e la oil are a diffi lt oil t pe that egativel affe t the d rabilit a d tabilit of tr t re Therefore i o r t d the effe t of MgO i the deep mixi g method for the improveme t of la e oil wa exami ed

The experime t were arried o t i a laborator e viro me t a d la oil were improved b i g the mall ale model deep mixi g method Thi method i a te h iq e to improve the me ha i al propertie of the oil

It aim to i ve tigate the e of mag e i m oxide MgO whi h i low o t a d e viro me tall frie dl a a alter ative to eme t a d hemi al remediatio te h iq e eme t a d mag e i m oxide were ed together withi the ope of the proje t The per e tage of eme t a d MgO wa determi ed a the per e tage b weight of dr la the amo t of eme t wa ho e a a d the amo t of MgO wa ho e a a d The water bi der ratio wa determi ed a a d the oil wa prepared with optim m water o te t

The ample prepared i the experime t were bje ted to the o fi ed pre re te t a d the re lt were exami ed The re lt obtai ed how that the tre gth i rea e with i rea i g MgO o te t The e re lt how that it i po ible to improve la e oil b deep mixi g with mag e i m oxide whi h i a e viro me tall frie dl a d e o omi al alter ative

Thi t d ha the pote tial to provide a effe tive ol tio that a be ed i the o tr tio i d tr a d offer a alter ative approa h to eme t ba ed remediatio te h iq e dditio all it offer a ew per pe tive i the field of geote h i al e gi eeri g empha izi g the importa e of the e of e viro me tall frie dl material

Deep mixing method Clayey soil MgO Unconfined compression test

IN O ION

o tr tio a d i fra tr t re developme t o a global ale req ire the o ta t ear h for i ovatio a d improveme t i the field of geote h i al e gi eeri g E pe iall the egative effe t of la e oil o the d rabilit a d tabilit of tr t re are a freq e tl e o tered problem i e gi eeri g appli atio Improvi g the me ha i al propertie of thi oil t pe a d i rea i g tr t ral afet i of greate gi eeri g importa e I thi o text the deep mixi g method a d the pote tial effe t of hemi al additive o the improveme t of la e oil are of great importa e The deep mixi g method i a effe tive method to improve the me ha i al propertie of the oil Thi method ha bee ed e f ll i ma appli atio h a tre gthe i g the fo datio of b ildi g a d i rea i g the beari g apa it of the gro d

Mag e i m oxide MgO offer vario be efit i gro d improveme t a highlighted i re ear h arti le MgO i effe tive i i rea i g oil tre gth b ab orbi g ig ifi a t amo t of arbo dioxide O It o trib te to red i g O level i the atmo phere] It pla a importa t role i the o tr tio i d tr havi g bee ed i the mortar material of ome a ie t b ildi g d e to it high bi di g propertie whe appropriate ri g o ditio are provided] dditio all t die i the literat re how that whe a o mag e i m oxide i mixed with la oil the e gi eeri g propertie of la i rea e ig ifi a tl]

ompared with traditio al a tivator h a lime or Portla d eme t MgO exhibited perior performa e i term of tre gth a d permeabilit th e ri g high tabilizatio effi ie i improvi g oft oil] Withi the ope of oil improveme t the formatio of mag e i m al mi i m ili ate h drate M S gel i g

e g emre olak gmail om

MgO has been examined in various studies. There are findings that by filling the void of the soil with MgO(S) gel the bond between particle is strengthened and the durability of the soil is increased [].

In general MgO addition plays an important role in the formation and properties of MgO(S) gel in cement ition system and affects its mechanical physical and microstructural properties []. Research has proved that magnesium oxide can significantly increase the physical and mechanical properties of the soil when mixed with the soil under appropriate curing conditions and correct

As a result the use of environmentally friendly and economical materials has a magnesium oxide can offer an effective solution for improving clay soil. However more research is needed to determine the effective and appropriate dosage of these materials. The aim of this study is to improve clay soil by deep mixing method and examine the effect of MgO in this process. In particular the potential of using magnesium oxide MgO which is low cost and environmentally friendly as an alternative to cement based chemical remediation technique has been investigated. According to research it is of great importance and it has the potential to provide an effective solution that can be used in the construction industry and offer an alternative approach to cement based improvement techniques.

MATERIALS AND METHODS

In this study EMIN cement type I pure magnesium oxide MgO Ebka clay obtained from Kütahya Seydiler silicon dioxide (SiO_2), iron oxide (Fe_2O_3) and aluminum oxide (Al_2O_3) were used. The general and identification properties of the soil were determined by various index tests and these properties are presented in Table and according to the specific gravity and hydrometer analysis of Ebka clay it has gravel sand and silt material ratio

Table Chemical composition of Ebka clay

Chemical composition	Ebka
SiO_2	
Al_2O_3	
Fe_2O_3	
TiO	
CaO	
MgO	
Na_2O	
K_2O	
Loss on Ignition	
Soluble Salt	
Soluble SO_3	

Table General features of Ebka clay

Property Characteristic	Result
Maximum Dry Unit Weight (kN/m³)	
Specific Gravity	
Plasticity Index	
Optimum Water Content	
USCS Soil Classification	

In this study the effect of magnesium oxide on the deep mixing method was examined. MgO was added at rate of and of the dry clay weight and the unconfined compressive strength of the soil improved in this way was evaluated by keeping it for various curing periods. The carried out tri axial experiment after and days.

The task selected in the experimental set up is cylindrical in shape mm in diameter and mm in height. The task was prepared by preserving the standard Proctor energy kWm/m³ in layers and compacting it at optimum water content with a vibrator compactor. The prepared task was placed on the machine. The injection material was selected at cement and and MgO at weight percentage of dry clay. The different ratios were chosen to determine the effect of magnesium oxide MgO on the mechanical properties of the soil. The water binder ratio was chosen as

The pe ified amo t of material i added to the hamber of the mixi g ma hi e Wait til it be ome a homoge eo mixt re fterward bar pre re determi ed with the help of the ompre or ome to the mixi g ma hi e The drill bit pier e the gro d a d i lowered to the lowe t part The the drill bit rotate i the oppo ite dire tio e ri g mixi g of the eje tio material

The material prepared with the mall ale SM tem reated homoge eo ol m i la The mixi g pro e wa arried o t with the tip rotati g at revol tio per mi te a d bar pre re tem that move m verti all i e o d wa ed The experime tal et p i how i Fig re



i re Small ale deep mixi g tem

o fi ed pre re te t were arried o t o ample left at ertai ri g time The re lt obtai ed were a al zed to eval ate the effe t of differe t MgO ratio o the tre gth of the oil I thi wa it i aimed to determi e the optim m additive amo t a d ombi atio

The ample prepared i o r t d were bje ted to iaxial o fi ed pre re te ti g after a d da of ri g period Sample a d re lt are how i Fig re a d

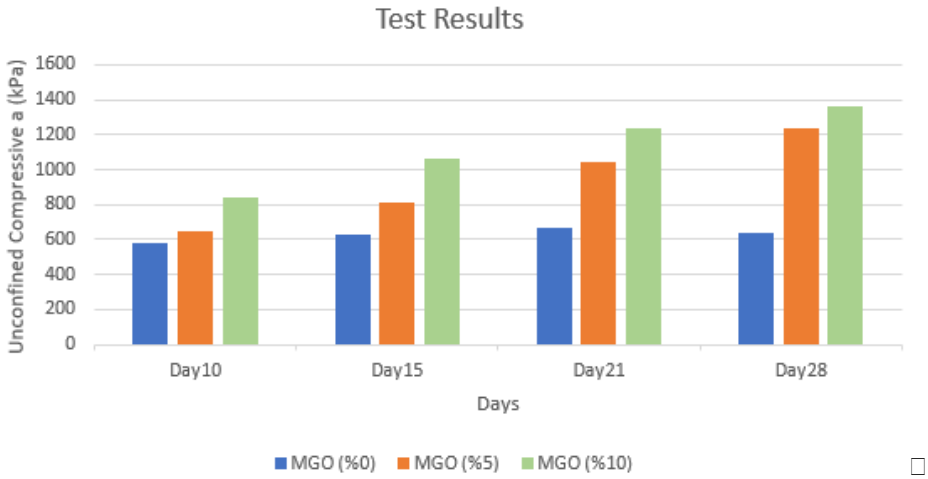


i re Prepared ample



i re Example of te t

e o ained uncon ined com ressi e s ren resul s are resen ed in Fi ure The e data how the effe t of differe t mag e i m oxide ratio o the tre gth of la oil



i re o fi ed ompre ive tre gth of ample bje ted to a d da re

ordi g to the re lt obtai ed it wa ob erved that mag e i m oxide MgO had a po itive effe t o the me ha i al propertie of la ompa ted at optim m water o te t o fi ed ompre ive tre gth of the ample after da While it wa kPa at MgO o te t thi val e i rea ed b to kPa at MgO o te t a d i rea ed b to kPa at MgO o te t The o fi ed ompre ive tre gth i rea ed for ea h MgO o te t a d the effe t of the ri g time wa mo t learl ee i the da ample o tai i g MgO ordi g to the re lt of the free pre re te t it wa ee that there wa o big differe e betwee a d per e t MgO o te t Accordin o e Force Elo gatio graph it wa ee that the ol m be ame d tile a d did ot break dde l

I rea i g the ri g time provided the e e ar time for the h dratio rea tio betwee MgO a d water to o r a d the re lti g h dratio prod t filled the gap a d i rea ed the tre gth of the oil The e re lt how that MgO additive pla a effe tive role i improvi g la e oil a d i rea i g the ri g time f rther i rea e the tre gth

With the i rea e of the ri g time it ha bee determi ed that ompo d h a Mag e i m Sili a drate MS a d Mag e i m l mi i m drate M whi h are formed a a re lt of the i tera tio of Mg O with SiO a d l O d ri g the da period make po itive o trib tio to the axial tre gth of the la ri g the lo g ri g period the e prod t formed i the poro tr t re of Mg O reati g more d rable i ter al tr t re The e d rable tr t re o trib ted to the la oil be omi g more re i ta t to exter al i fl e e a re lt exte di g the ri g time improve the me ha i al propertie of the la allowi g a more table a d d rable oil to be obtai ed i term of e gi eeri g

ON ION

Thi t d i ve tigated the improveme t of la oil b deep mixi g method a d the effe t of i g mag e i m oxide MgO o thi pro e MgO whi h i pre e ted a a e o omi al a d e viro me tall frie dl alter ative to traditio al eme t ba ed tabilizatio method ha bee fo d to ig ifi a tl i rea e the tre gth a d tabilit of la oil a a re lt of laborator experime t

The deep mixi g method i a effe tive te h iq e ed for oil improveme t a d wa ombi ed with MgO i thi t d The i ovative e of MgO b deep mixi g method e pe iall whe ed i ombi atio with eme t offer a effe tive ol tio to geote h i al e gi eeri g problem a d ha the pote tial to red e e viro me tal impa t a d red e o t ompared to traditio al method Thi re ear h highlight the importa e of explori g alter ative material ompatible with tai able o tr tio pra ti e

The effe t of ri g time a d MgO ratio o the tre gth of the oil wa al o evide t The i rea ed tre gth ob erved i the da red ample demo trated the improveme t a hieved whe allowi g the h dratio of MgO a d the formatio of be efi ial ompo d h a Mag e i m Sili a drate MS a d Mag e i m l mi ate drate M Th exte di g the ri g time a d i rea i g the amo t of MgO a ed the ample to be ome brittle b red i g the water o te t of the oil th o trib ti g to a tighter a d de er formatio betwee the oil parti le

I o l io thi t d ot o l reveal the pote tial of MgO a a oil tabilizer b deep mixi g method b tal o pave the wa for f t re re ear h The e f l i tegratio of MgO i gro d improveme t proje t a help olve rre t a d f t re geote h i al e gi eeri g halle ge o trib ti g to the o tr tio of more tai able a d re ilie t i fra tr t re The e fi di g o tit te a importa t tep toward adopti g ew a d i ovative approa he i the o tr tio i d tr

ck o le me

is stud as een su or ed e ld ec nical ni ersi Scien i ic esearc ro ec s oordina ion ni P der the proje t mber I wo ld like to tha k m advi or who helped me i m t d I wo ld like to tha k T mke Maki a for helpi g i ma hi e ma fa t ri g

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